IRON & COAL

THE IRON AND COAL TRADES' REVIEW

VOL. 183 No. 4673

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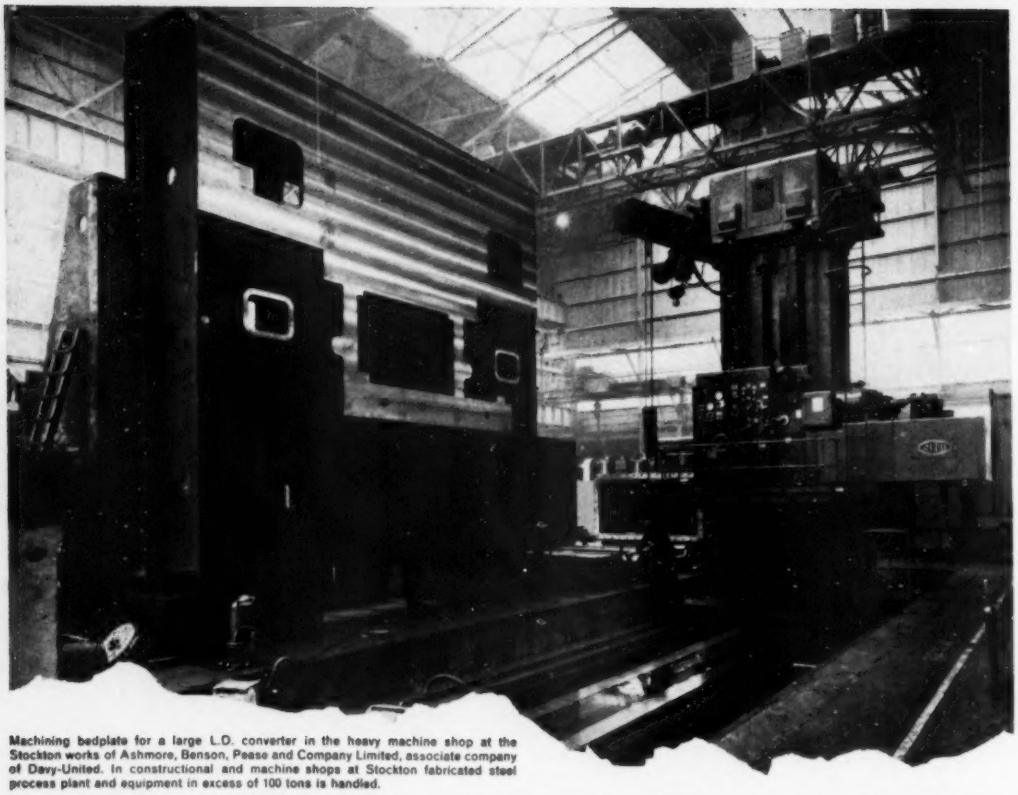
10 years ago
The first Cable Belt rope driven conveyor was installed
... a recent installation is to the best of our knowledge the
LONGEST BELT CONVEYOR IN THE WORLD with one driving unit.
Installed at Coal Cliff Colliery in New South Wales, Australia this conveyor is about
2½ MILES LONG!
distance no object with
CABLE BELT ROPE DRIVEN CONVEYORS
CABLE BELT ROPE DRIVEN CONVEYORS
CABLE BELT LTD. LONGMAN INDUSTRIAL ESTATE, INVERNESS, SCOTLAND
Telephone: Inverness 34661 2 Telegrams: Cablebelt, Inverness
Agents in: AUSTRALIA; BENELUX COUNTRIES; CANADA; FINLAND; FRANCE; GERMANY; INDIA; JAPAN; NORWAY; SINGAPORE & MALAYA; SOUTH AFRICA; SPAIN; SWEDEN; U. S. A.

Steel PROCESS PLANT



Machining bedplate for a large L.D. converter in the heavy machine shop at the Stockton works of Ashmore, Benson, Pease and Company Limited, associate company of Davy-United. In constructional and machine shops at Stockton fabricated steel process plant and equipment in excess of 100 tons is handled.

DESIGN · MANUFACTURE · ERECTION

Complete oxygen steelmaking shops
Top blown, bottom blown and rotary converters
Ancillary equipment . . . casting ladles . . . scrap charging cars . . . slag ladles and carriages
Continuous casting plants
Project engineering for complete steelworks development schemes

Steel processes division

DAVY-UNITED | **DAVY-ASHMORE GROUP**

DAVY AND UNITED ENGINEERING COMPANY LIMITED · SHEFFIELD

LONDON · STOCKTON · GLASGOW · MIDDLESBROUGH · HULL · PARIS · MONTREAL · MELBOURNE · SYDNEY · JOHANNESBURG · SALISBURY · CALCUTTA · BOMBAY

503

PERPETUAL MOTION? IT'S IMPOSSIBLE—

...but BTR CONVEYOR BELTS

KEEP THINGS MOVING

Perpetual motion? Mechanically unattainable. *Almost* perpetual motion—that's different. BTR Conveyor belts are a good example. Day in, day out, for months and years, whatever the load. With the minimum of servicing. They come in any length and width, off the peg or made (very specially) to measure. BTR never stops experimenting, improving, striving for perfection. Consult BTR about conveyor belts ... it always pays to go to the experts.

BTR

BTR Industries Ltd

ENGINEERS IN RUBBER AND PLASTICS

HERGA HOUSE, VINCENT SQUARE, LONDON S.W.1

1/3857

a Q.C.

". . .'Members of the Jury' I'd begin—and I reckon that would be my lot.

"You want a cool, calculating brain to tackle a job like that. Every step planned in advance—on your toes every minute of the day and heaven help the client if you make a mistake.

"A bit like casting a roll when you come to think of it—except for the talking. Always one move in front of the metal, every detail worked out to a hair-breadth and all the time Charlie, the crane driver, is sitting in his box like a blooming judge.

"As for the Jury? Well, I reckon all of us at AW fill that bill, but speeches won't sway us—it's the **result** that counts here."

CLOSELOY ROLLS – perfection in Roll technique

AW

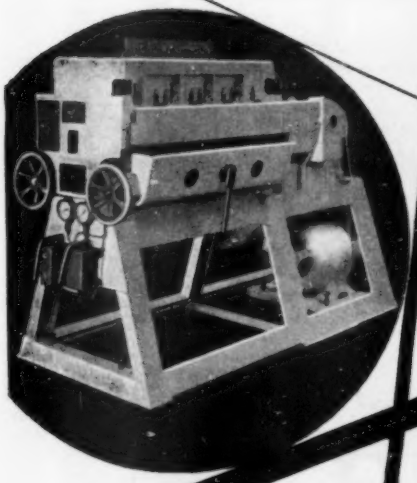
ARMSTRONG WHITWORTH (METAL INDUSTRIES) LIMITED

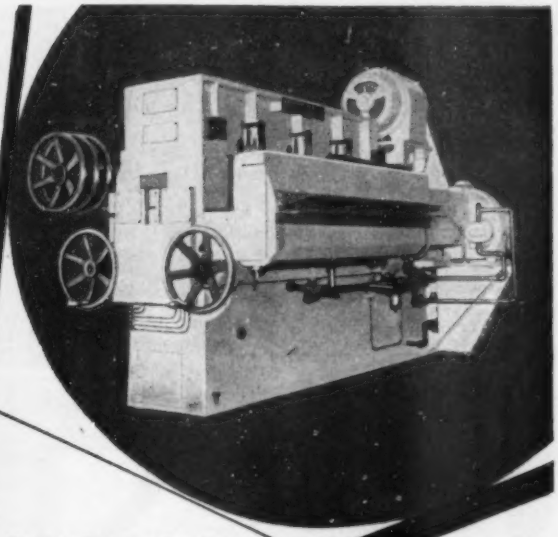
Close Works, Gateshead 8, Co. Durham. Tel: Gateshead 71261

Steel Foundry: Western Road Works, Jarrow, Co. Durham

aluminium foil or armour plate

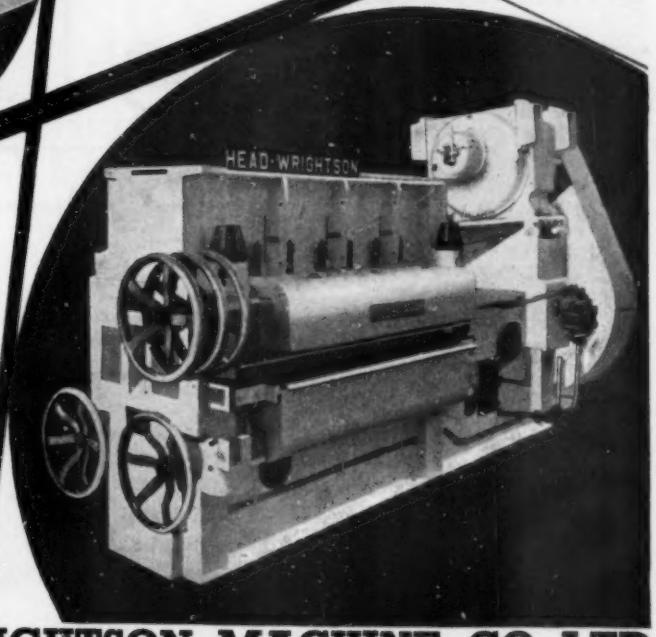
Left: 1¼" Pressure Regulating Roller Leveller





Top: 1¾" Processor Leveller

Bottom: 2½" Pressure Regulating Roller Leveller



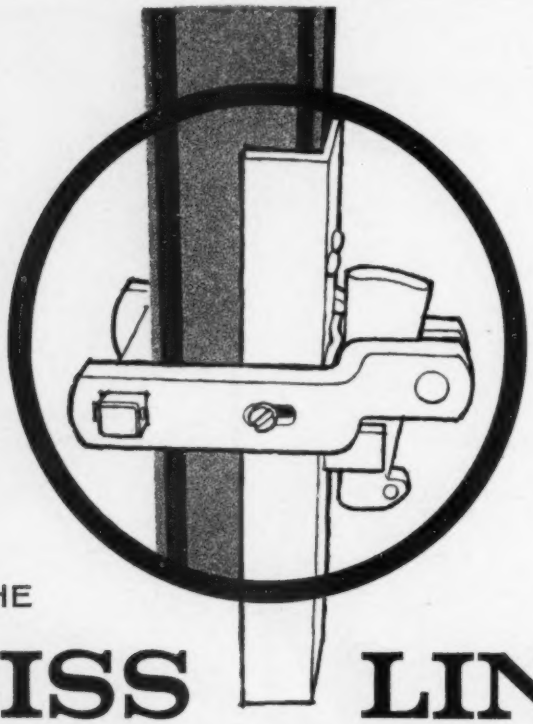
The Head Wrightson Machine Company manufactures a very wide range of roller levellers for levelling from aluminium foil to heavy steel plates. Further information is available on request and our Sales Engineering Department will be pleased to give advice. For immediate service telephone Middlesbrough 43401.

THE HEAD WRIGHTSON MACHINE CO LTD

COMMERCIAL STREET MIDDLESBROUGH

LONDON JOHANNESBURG SYDNEY and CALCUTTA

P1405



INTRODUCING THE

BAYLISS LINK STILT

FOR COLLIERY ARCH SUPPORTS

Specially designed to provide the yielding action essential to colliery arches, as simply and reliably as possible, the Link Stilt is the latest addition to the many Bayliss products giving service to the Mining industry.

Attached in a few minutes and loaded by the spring-cushioned wedge, the Link Stilt is a completely self-contained unit which can be removed and re-used as often as required.

The range covers all standard N.C.B. Arches.

Write to Head Office for full details of the Bayliss Link Stilt. We'll be happy, too, to send particulars of BJB Roof Bolts, which can help cut support costs by up to 30%.

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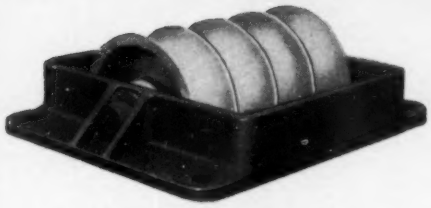
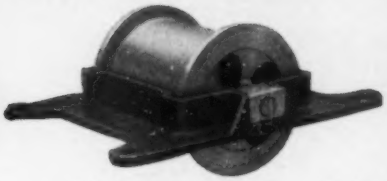
BJB GKN

Follsain-Wycliffe

FOUNDRIES LTD



'CY' Multiple Rollers mounted in Malleable Iron Frame



'CY' Rollers to NCB Spec. P110/1954 mounted in Malleable Iron Frame with renewable 'Wynite' bearings. 14 ranges of sizes available, also supplied with Ball or Oilite bearings.

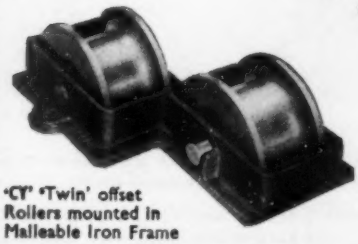
CY

'CY' Haulage Surge Wheel Segments

abrasion-resisting alloy outlasts chilled iron by 3-5 times

other applications include
STOWAGE & WASHERY, PIPE BENDS & INSERTS & LINER PLATES

'CY' Brake Blocks for Shunting or underground Loco's



'CY' 'Twin' offset Rollers mounted in Malleable Iron Frame

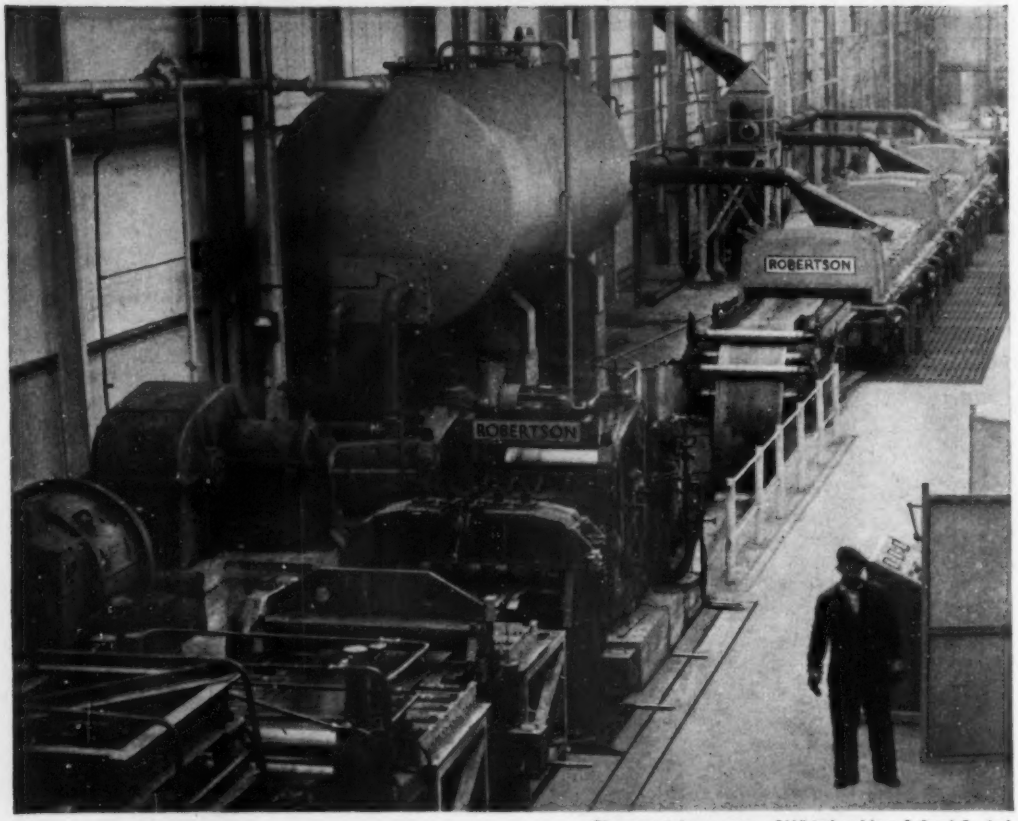
'CY' Angle Rollers mounted in Malleable Iron Frame

FOLLSAIN-WYCLIFFE FOUNDRIES LIMITED

Lutterworth nr Rugby

Tel: Lutterworth 10, 60, & 152

ROBERTSON
in ENGLAND



Photograph by courtesy of Whitehead Iron & Steel Co. Ltd.

Continuous Pickling Line for Mild Steel Strip built and installed by Robertsons at the Newport (Mon.) Works of Whitehead Iron & Steel Co. Ltd.

We also specialise in annealing and pickling lines for any quality of strip — ferrous or non-ferrous. Our range of products include hot and cold rolling mills, flattening and shearing machines, slitting machines, straightening machines, swaging machines, wire drawing machines, tube making machinery, and other metal working equipment.

W. H. A. ROBERTSON & CO. LTD.
BEDFORD • ENGLAND

LICENSEES FOR THE BUILDING OF SENDZIMIR COLD REDUCTION MILLS AND PLANETARY HOT MILLS AND HALLDEN FLYING SHEARS

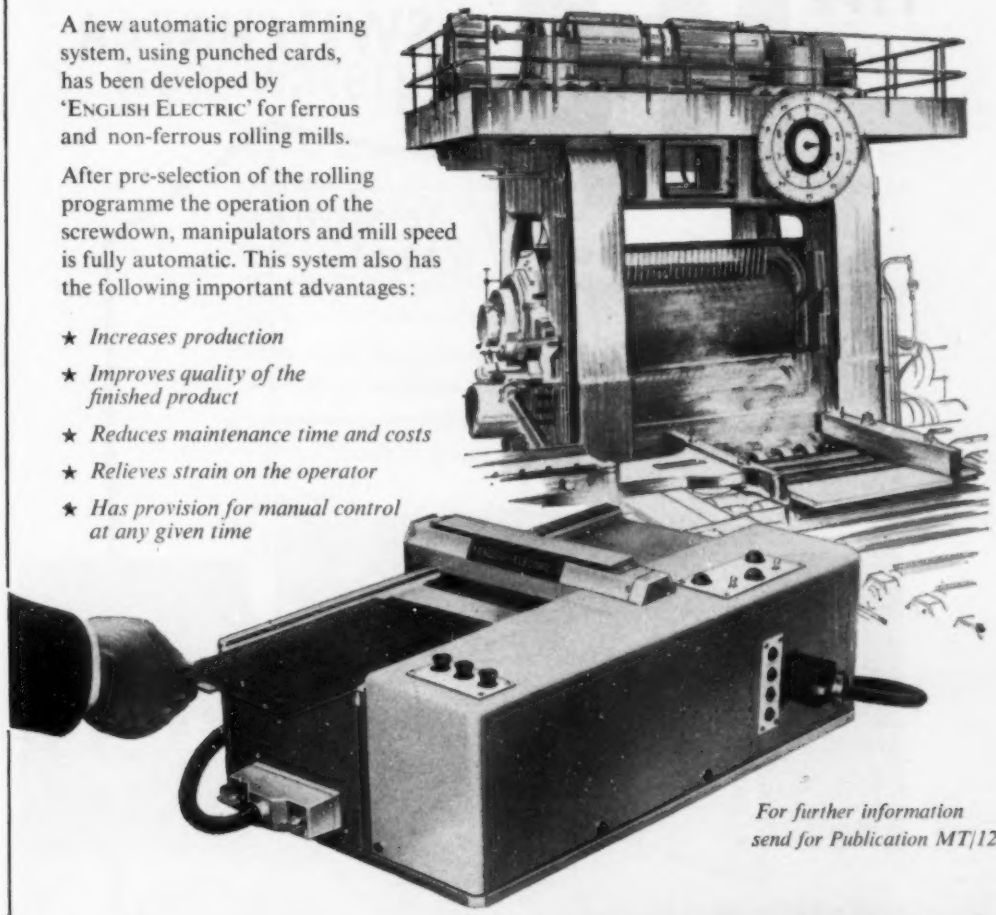
WT.355W

AUTOMATIC MILL PROGRAMMING

A new automatic programming system, using punched cards, has been developed by 'ENGLISH ELECTRIC' for ferrous and non-ferrous rolling mills.

After pre-selection of the rolling programme the operation of the screwdown, manipulators and mill speed is fully automatic. This system also has the following important advantages:

- ★ *Increases production*
- ★ *Improves quality of the finished product*
- ★ *Reduces maintenance time and costs*
- ★ *Relieves strain on the operator*
- ★ *Has provision for manual control at any given time*



For further information send for Publication MT/126

'ENGLISH ELECTRIC' rolling mill experience is world wide and for more than half a century the Company has promoted new techniques for mills of all types working under widely different conditions. This experience is available for planning and electrically equipping new mills and the modernisation of existing mills.

'ENGLISH ELECTRIC'

rolling mill equipment

METAL INDUSTRIES DIVISION, STAFFORD

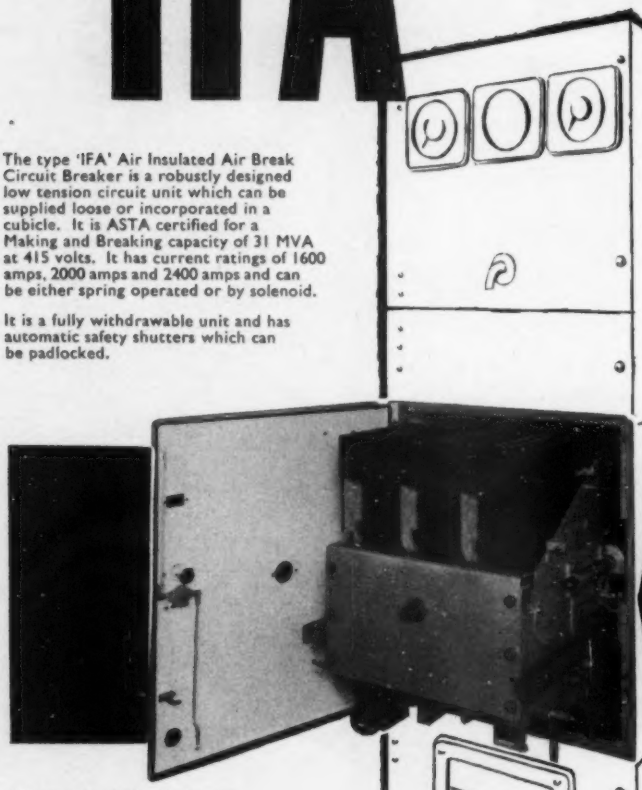
The English Electric Company Limited, English Electric House, Strand, London, W.C.2.

MT.62

TYPE IFA AIR BREAK SWITCHGEAR

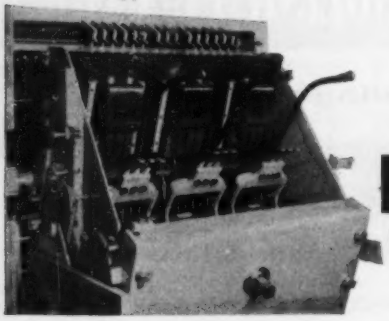
The type 'IFA' Air Insulated Air Break Circuit Breaker is a robustly designed low tension circuit unit which can be supplied loose or incorporated in a cubicle. It is ASTA certified for a Making and Breaking capacity of 31 MVA at 415 volts. It has current ratings of 1600 amps, 2000 amps and 2400 amps and can be either spring operated or by solenoid.

It is a fully withdrawable unit and has automatic safety shutters which can be padlocked.



31 MVA
415 V

When required a 3 phase Earthing Device, which is certified 31 MVA for three seconds, can also be supplied.



WB

WHIPP & BOURNE LTD.

CASTLETON · ROCHDALE · LANCS

'Unipruf'

New waterproof explosive

Most Eq. S. explosives for the production of round coal—even the most up-to-date ones—have had one drawback: they could only be used in dry conditions.

Now I.C.I. announces 'UNIPRUF'—a waterproof equivalent to 'UNIFRAX' that can be used reliably and successfully in naturally damp or wet surroundings.

Tests show that pierced cartridges of 'UNIPRUF' detonate with unimpaired efficiency after 2½ hours complete immersion in water!

'UNIPRUF' joins 'UNIFRAX' to make a team of round-coal explosives available for use *in all conditions.*

'Unifrax'—for dry seams

'Unipruf'—for damp or wet seams

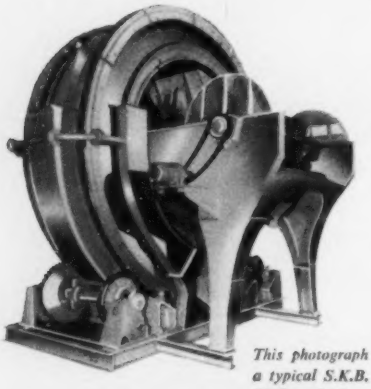
TILMANSTONE

N.C.B. South Eastern Division

COAL PREPARATION PLANT

by Jenkins

of course!



This photograph shows a typical S.K.B. Dense Medium bath.

The above drawing is an artists impression of the new Coal Preparation Plant to be erected at Tilmanstone. It will handle 250 tons of coal per hour and incorporate the first Schuchtermann and Kremer-Baum 'Teska' Dense Medium Washers to be installed in this country.

W. A. JENKINS AND COMPANY LIMITED, P.O. BOX No. 3, RETFORD, NOTTS. (RET 2551)

A MEMBER OF THE WIGGINS GROUP OF COMPANIES

...With the compliments of

DORMER

Exceptional performance from an odd drill in a batch are of little value to the regular run of Twist Drills. Multiple drilling, repetitive drilling, production drilling, demand consistency in the working life of each tool, therefore the capability of obtaining extra holes from every drill is an obvious advantage. The manufacture of DORMER Drills is keyed to this very principle.

MAKERS OF THE FINEST TWIST DRILLS
– BY ANY STANDARD

THE SHEFFIELD TWIST DRILL AND STEEL COMPANY LIMITED
SHEFFIELD **ENGLAND**

DORMER TOOLS ARE OBTAINABLE FROM YOUR USUAL ENGINEERS' MERCHANTS

PIT TUB PEDESTAL

STUDY THESE FEATURES

- Frictional resistance and starting effort reduced to an absolute minimum, providing a considerablesaving in haulage power.
- Position of legs arranged to give ample space for operation of automatic greasers.
- No wastage of grease due to edge of bearing scraping excess lubricant off the axle and dropping it on roadway.
- Wheels can be removed without taking Pedestals off the Tub.
- Bearing seat so arranged that the axle only collects enough grease from storage pockets for efficient lubrication.
- Ingeniously designed interior recesses and pockets automatically allow grease applied to axle to be drawn into bearing and deposited in the storage pockets.
- Interior shape of bearing allows sufficient grease to creep to outer bearing face for lubrication of wheel boss.
- Axles retained in position by our " SIMPLOK " Lock Bolt.
- Pedestal designed to give maximum strength for minimum weight.
- Made of Toughened Cast Steel for long service under arduous conditions.

On receipt of particulars of what you are now using we shall be pleased to submit a quotation.

ROBERT MORRIS LIMITED FARNWORTH BOLTON

'PATHFINDER'

ENGINEERING'S GREATEST STEP FORWARD IN THE FIELD OF ROOF SUPPORTS

KINDER TO THE ROOF
'PATHFINDER' CONTROLS CONVERGENCE
ASSURES GREATER SAFETY
—CUTS MAINTENANCE COSTS, TOO!

NCB APPROVAL No. H 16

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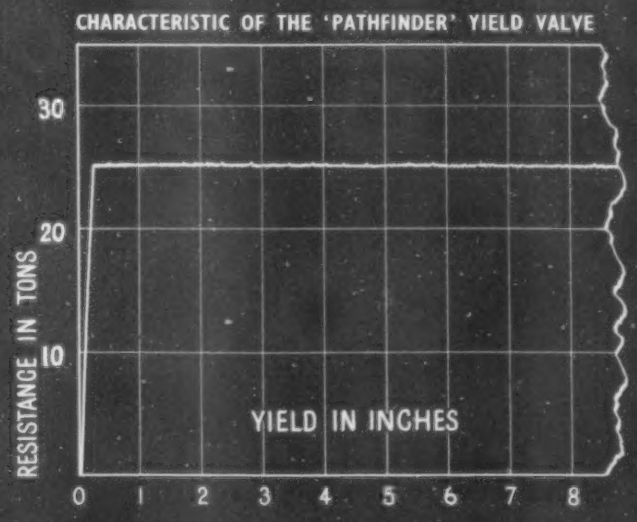
'PATHFINDER' HYDRAULIC PROPS



MASTABAR MINING EQUIPMENT CO. LTD.

Church Bank Works, Church, Lancs. Tel. Accrington 35411 (3 lines)

CARDIFF · LONDON · NOTTINGHAM · LEEDS · ACCRINGTON · NEWCASTLE UPON TYNE

Makers of the 'Comet' Colliery Conveyor Belt Lacing System

A UNIQUE CASE...

...Co-moulded under high pressure, the brick and four-sided casing form an integral unit ensuring absolute accuracy of shape and size with maximum volume stability during use. Manufactured in a full range from 100% chrome ore to 100% Magnesite.

GR FERROCLAD

METAL-CASED
CHEMICALLY BONDED
BASIC BRICKS

FERROCLAD 'EE' BRICKS
Divided internally by two plates placed lengthwise. This system reduces flaking and spalling to a minimum and can be applied to all Ferroclad shapes and sizes.

TABHANGER SUSPENSION
Bricks supplied with a special stainless brick tab co-moulded with the brick are imbedded into the surface of the top face. The tab may be bent out at right angles to the top face to form a hanger.

FERROCLIP SUSPENSION
Allows the brick to be suspended from the end. The Ferroclip hanger slot may be moulded into any roof or wall shape.

THE GENEFAX GROUP
for everything in Refractories

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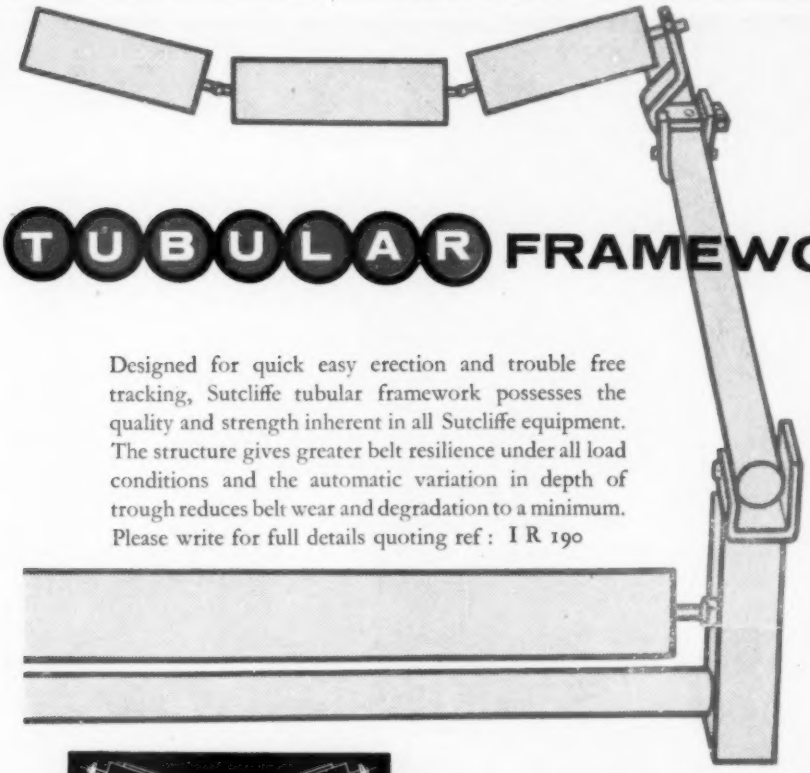
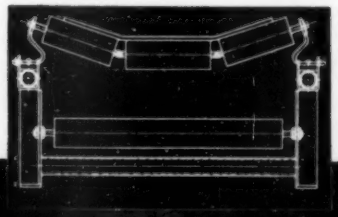
GENERAL REFRACTORIES LTD

GENEFAX HOUSE · SHEFFIELD 10 · Telephone: 31113



TUBULAR FRAMEWORK

Designed for quick easy erection and trouble free tracking, Sutcliffe tubular framework possesses the quality and strength inherent in all Sutcliffe equipment. The structure gives greater belt resilience under all load conditions and the automatic variation in depth of trough reduces belt wear and degradation to a minimum. Please write for full details quoting ref : I R 190



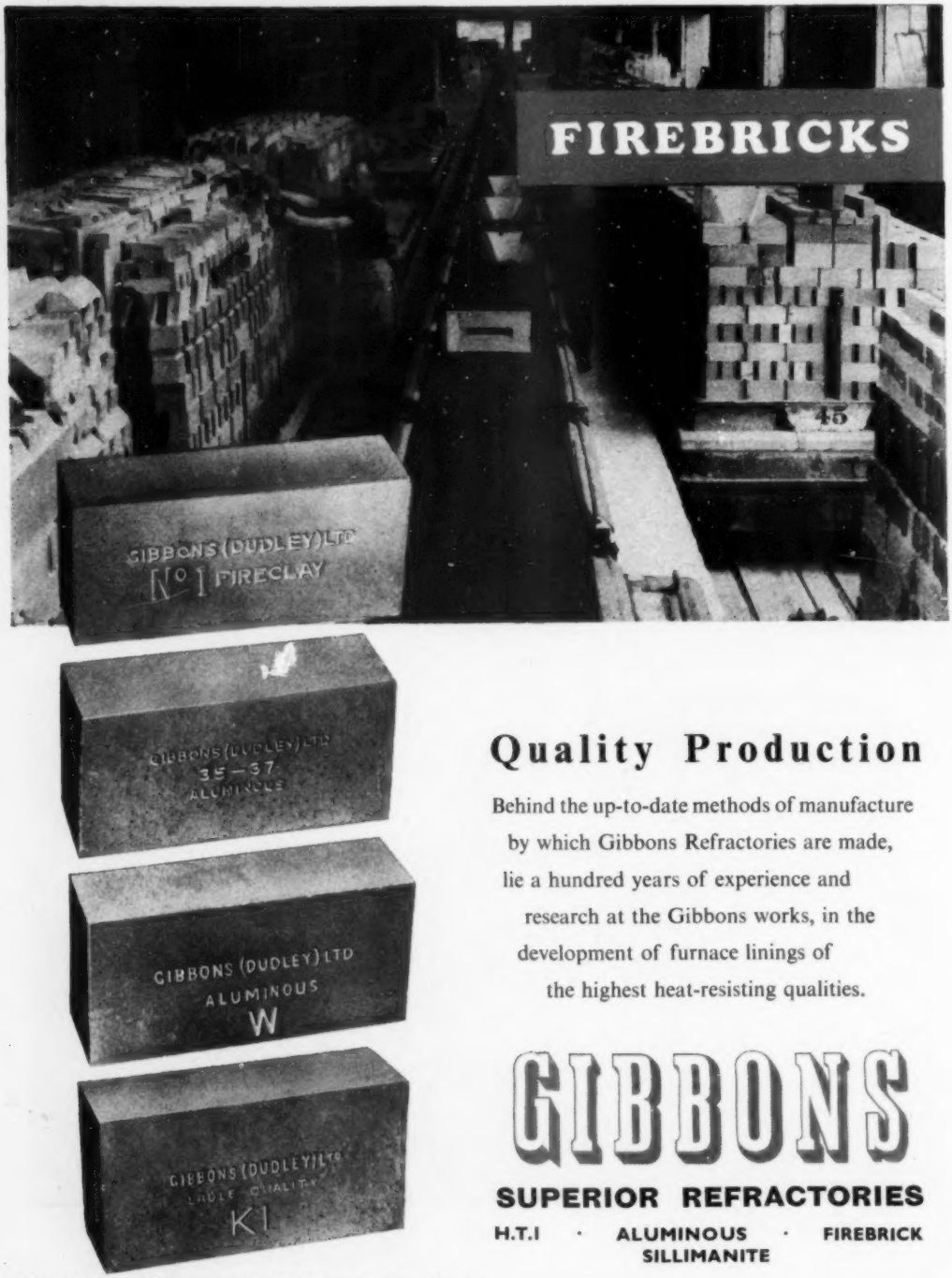
Left: Typical cross-section through framework.

Below: The conveyor in operation underground.
(Photograph by courtesy of N.C.B. Durham Division).

Britain's Best Conveyors

RICHARD SUTCLIFFE LTD. HORBURY WAKEFIELD

dm RS190



Quality Production

Behind the up-to-date methods of manufacture by which Gibbons Refractories are made, lie a hundred years of experience and research at the Gibbons works, in the development of furnace linings of the highest heat-resisting qualities.

GIBBONS

SUPERIOR REFRACTORIES

H.T.1 · ALUMINOUS · FIREBRICK
SILLIMANITE

Gibbons (Dudley) Ltd., Dibdale Works, Dudley, Worcs.

M-W.130

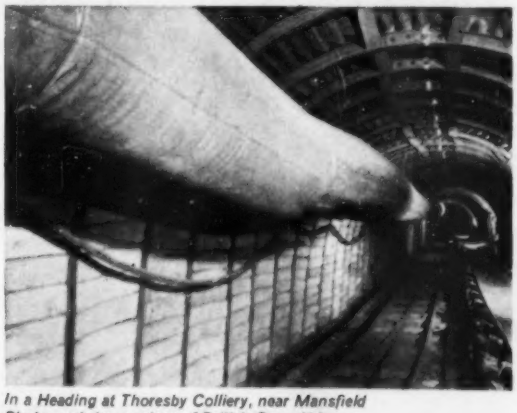
MC-4

Congratulations... you must be the chap who suggested we change to plastic ventilating ducts reinforced with HIGH-TENACITY RAYON. A brilliant idea—well done!

Plastic ventilating ducting with HIGH-TENACITY RAYON—
Is more easily assembled than metal ducting.
Is lighter and more portable.
Withstands rough treatment.

Ducting reinforced with HIGH-TENACITY RAYON lasts longer and is more economical than plastics ducting reinforced with other textiles.

Courtaulds Limited, 16 St. Martin's-le-Grand, London, E.C.1



In a Heading at Thoresby Colliery, near Mansfield
Photograph by courtesy of British Geon Ltd.

Courtaulds yarns and fibres in the fabric of industry

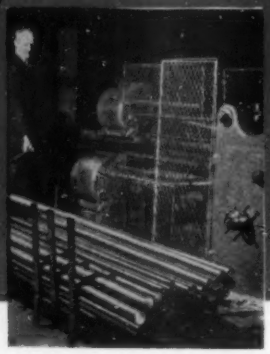
We go to great lengths . .

. . . (6ft to 12ft) . .

. . . to ensure satisfaction with

HOLFOS BRONZE

CONTINUOUSLY CAST
round bars and tubes



accurate & true
sound & dense
reeled & smooth
minimum machining

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ROCHDALE LANCS. TEL. ROCHDALE 3155

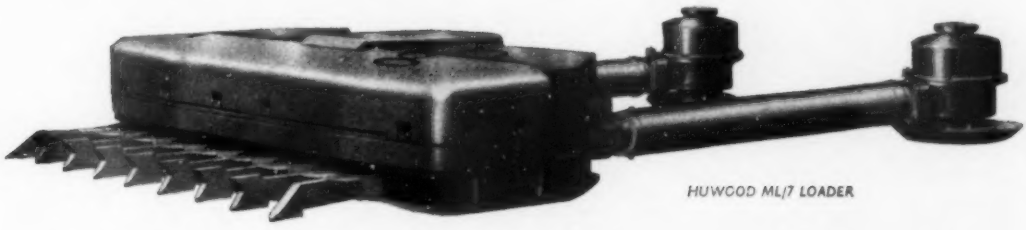
HL28

NO 'SIXES AND SEVENS'!

The term 'sixes and sevens', which stands for confusion and general mayhem, has acquired an entirely new meaning since the introduction of the Huwood ML/7 Loader. With its slightly older and taller sister, the ML/6, it is making a formidable attack on the problem of low seam mechanisation. The ML/6 is 1′ 9″ in height, the ML/7 is 1′ 4½″ in height and of slightly greater width. Both offer the advantage of requiring a low capital investment appropriate to the seams in which they are used. Both minimise coal degradation. Both are hydraulically propelled and both are noted for quiet and efficient production.

The difference between 'sixes and sevens' and 'ML sixes and sevens' is something much appreciated in the mining industry of today.

HUWOOD ML/6 LOADER ON THE FACE



HUWOOD ML/7 LOADER

HUGH WOOD & CO. LTD.

Head Office and Factories:
GATESHEAD - ON - TYNE, 11.
Telegrams: Huwood, Gateshead. Telephone: Low Fell 76083 (5 lines).

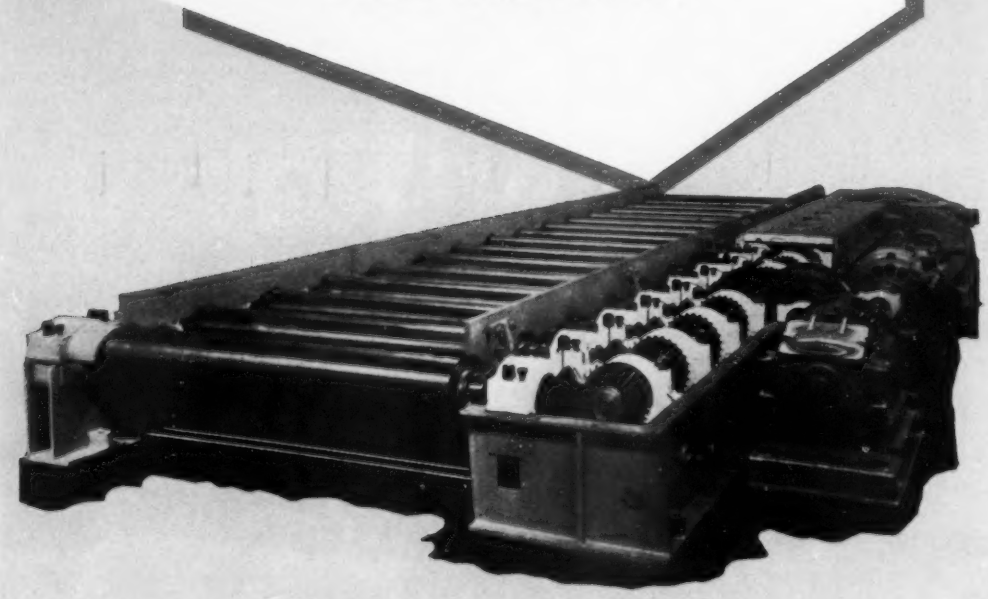
Industrial and Export Office:
ROYAL LONDON HOUSE, FINSBURY SQUARE, LONDON, E.C.2.
Telegrams: Huwood Stock, London. Telephone: Monarch 3273 (4 lines).

ML/FA/235

BRIGHTSIDE

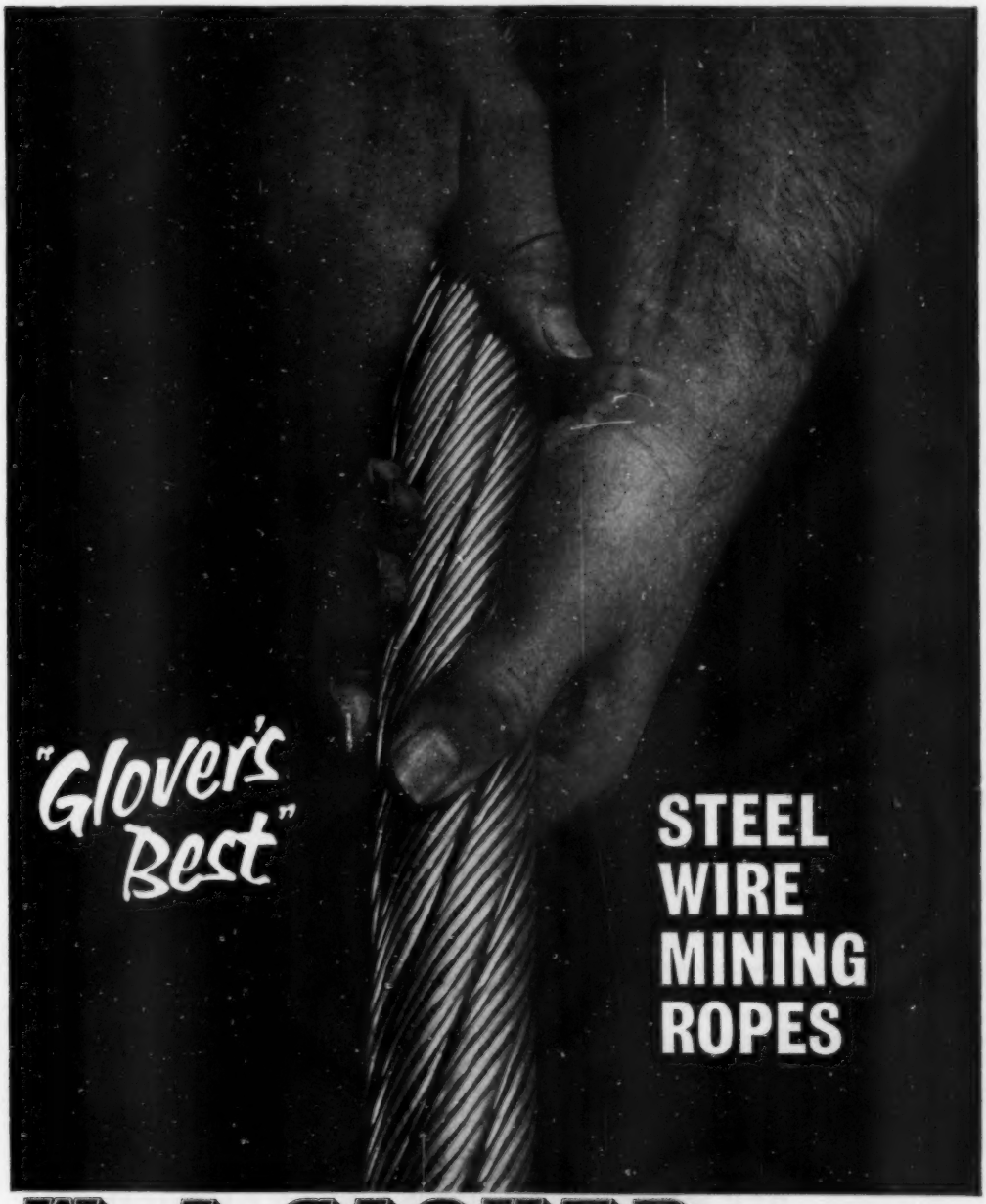
Hot and Cold Rolling Mills
Rolls for Hot and Cold Rolling
Roll Lathes
Hot and Cold Shears
Hot Saws and Reelers
Steelworks Plant and Auxiliaries

26" Structural Mill Approach Roller Table.



THE BRIGHTSIDE FOUNDRY & ENGINEERING CO. LTD. SHEFFIELD

S69



WM. JAS. GLOVER & CO. LIMITED

(EST. 1818) ST. HELENS LANCS Tel: St. Helens 6159 Grams: "Glovers, St. Helens"

A MEMBER OF THE GLOVER GROUP

Don't let it slip through your fingers!

Briquetting enables fine pulverulent materials, metal bearing ores, ferrous and non-ferrous swarf to be used economically. It makes handling, transporting and stocking easier and, where the material is required for processing, it can improve production.
Sutcliffe, Speakman will be happy to discuss with you this method of utilising materials to the best advantage. They can give expert advice on the type of press needed, and they will install it and gear it to your precise requirements.
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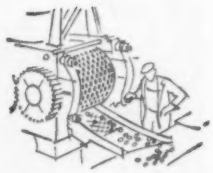

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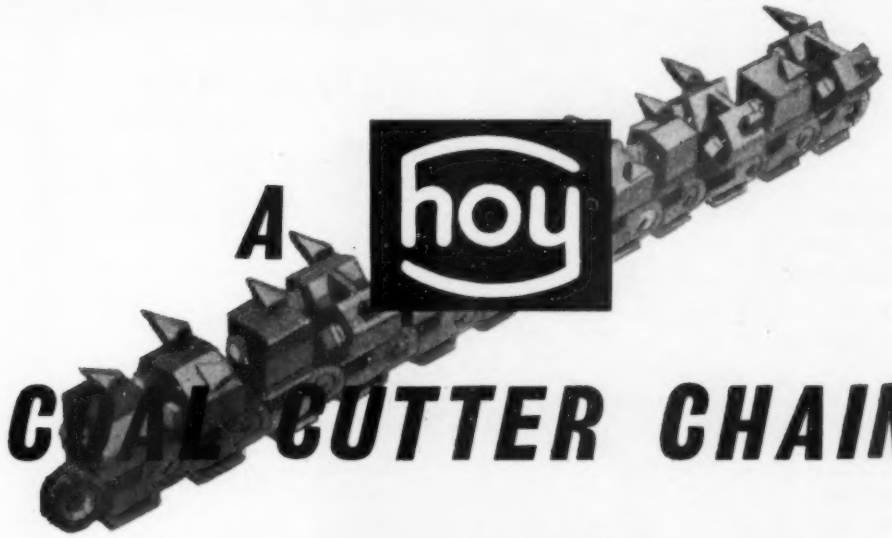

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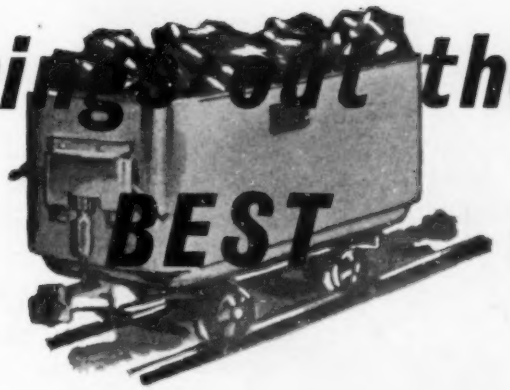

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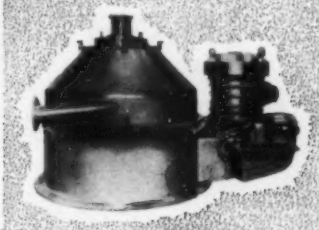

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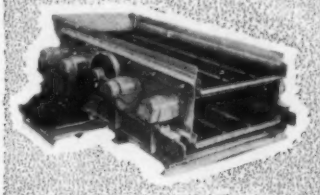

PUBLICATION No. G.557

HANDLING

CONVEYORS

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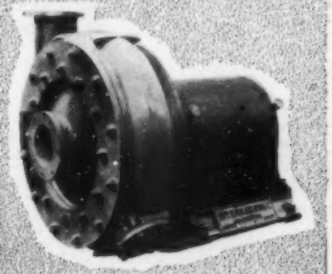

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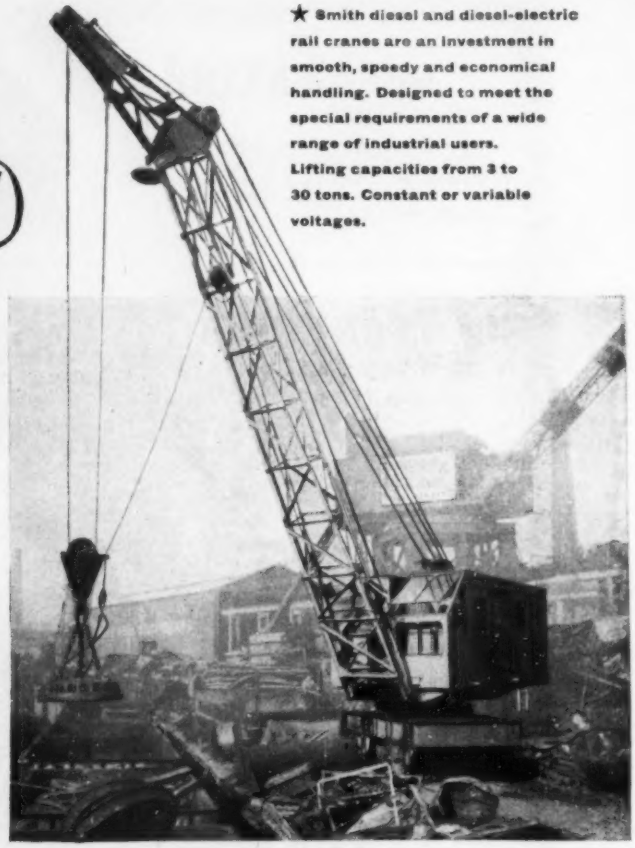

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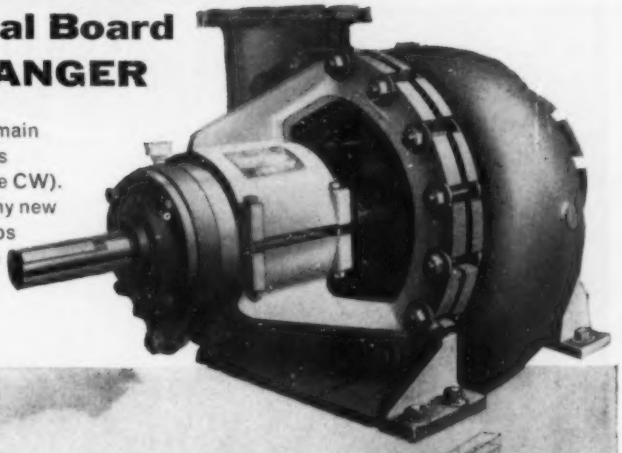

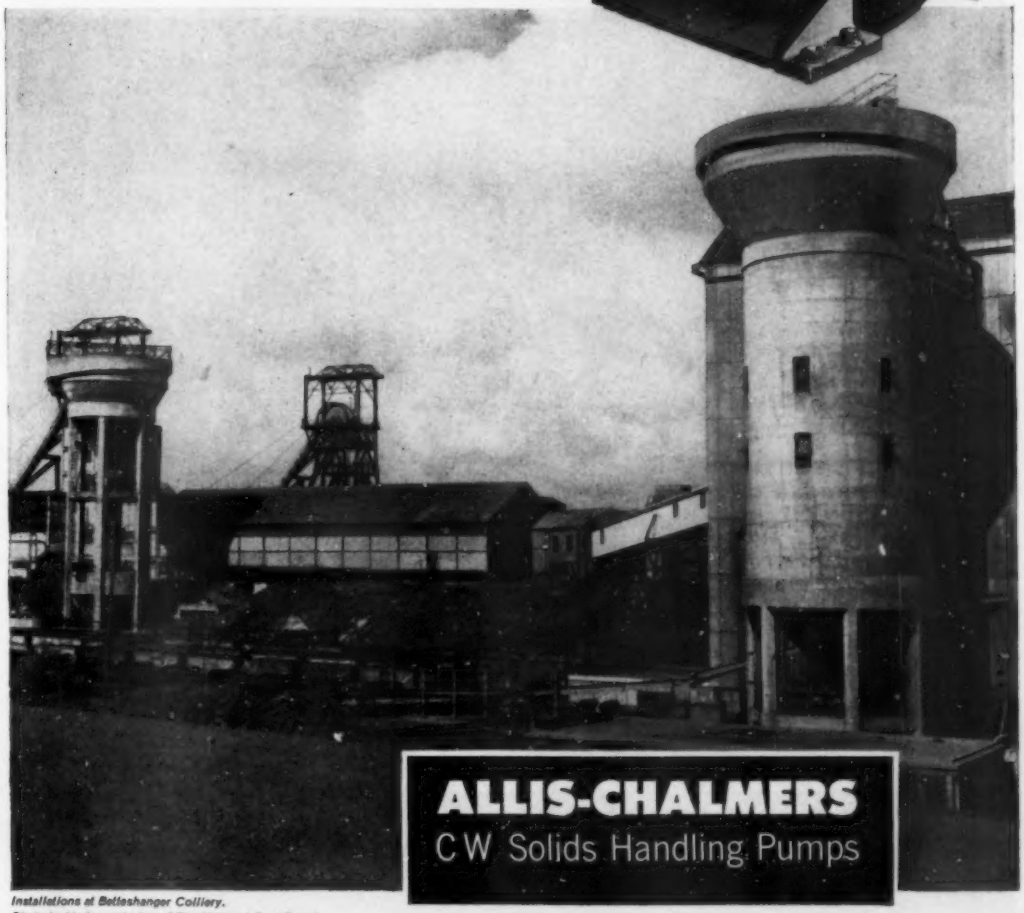

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Installations at Betteshanger Colliery.
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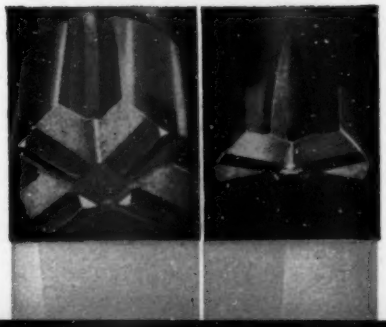

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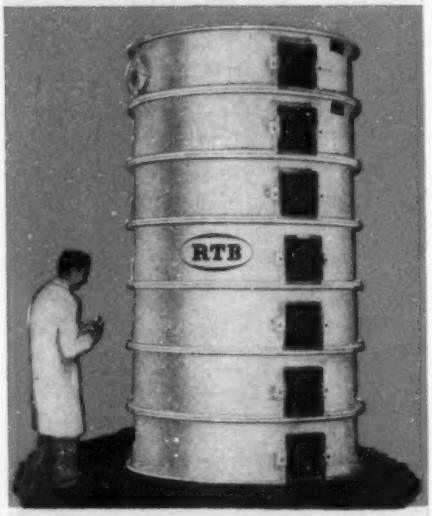

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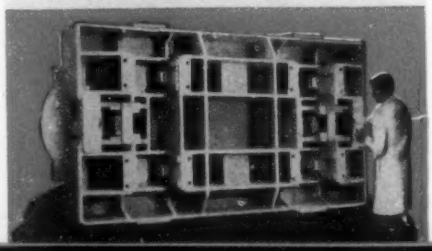
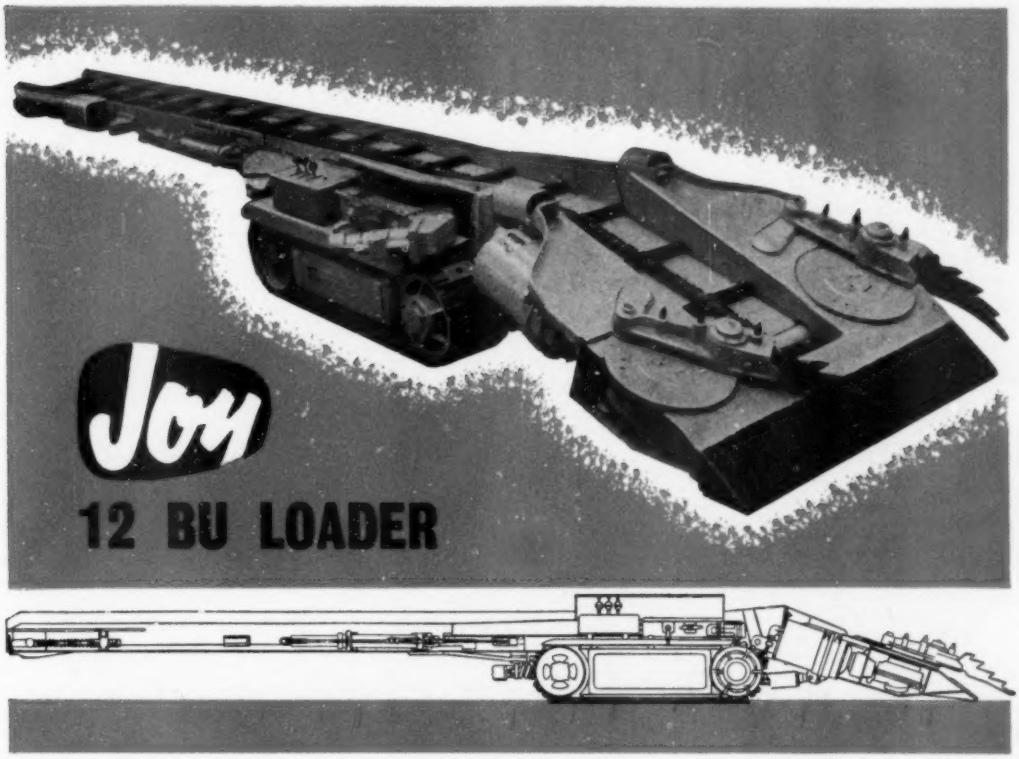
View of underside of 80-ton capacity ingot car supplied to Ebbw Vale Steel Works.





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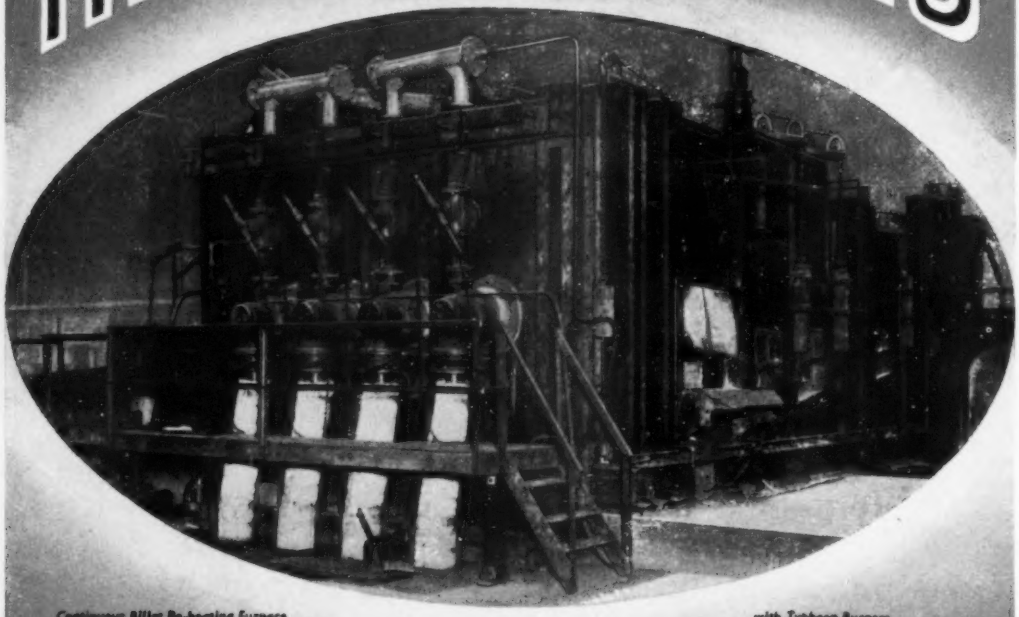

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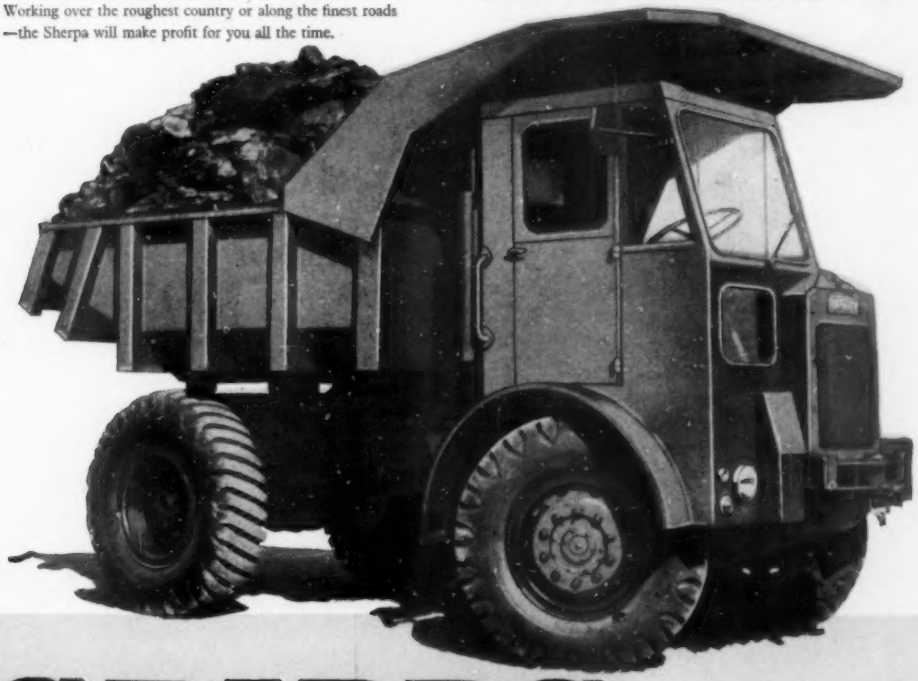

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3. Flameproofed to British Standards.

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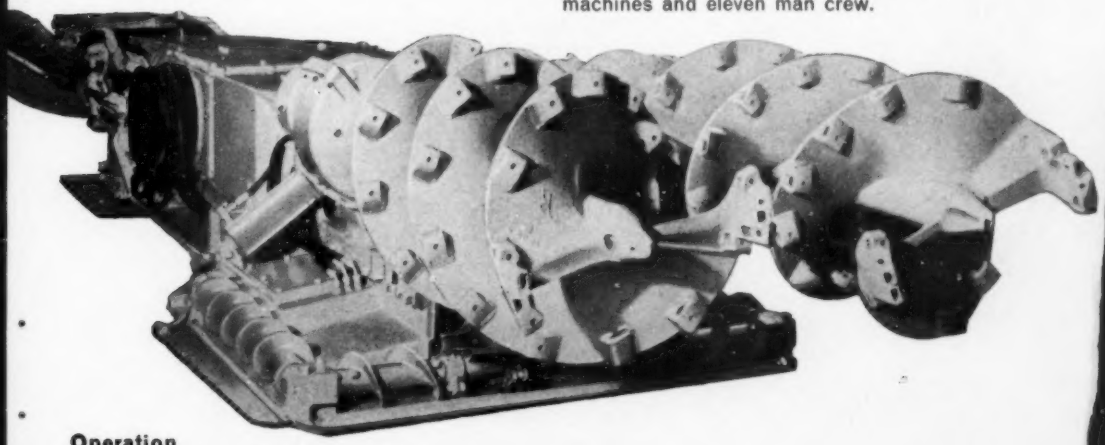

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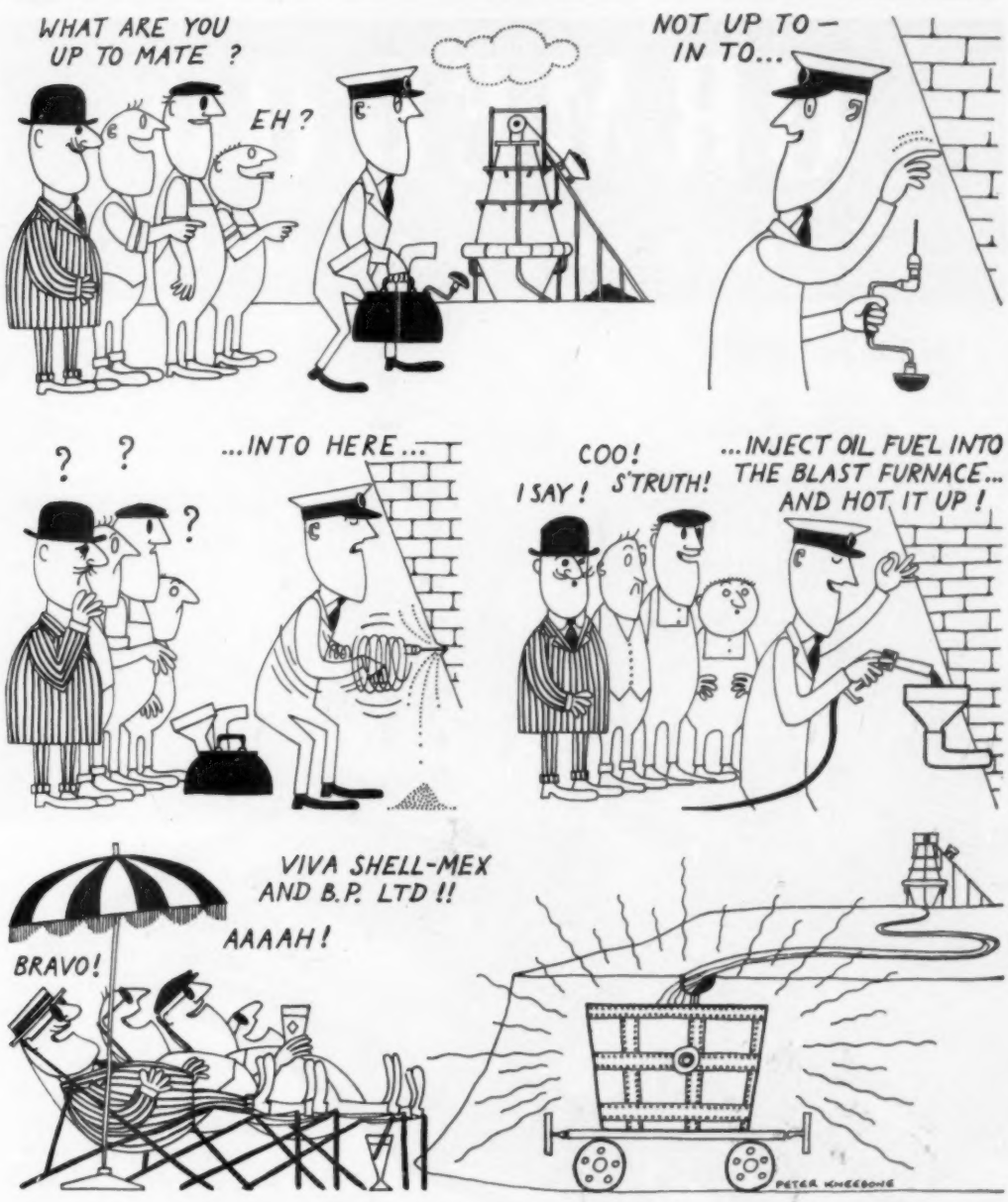
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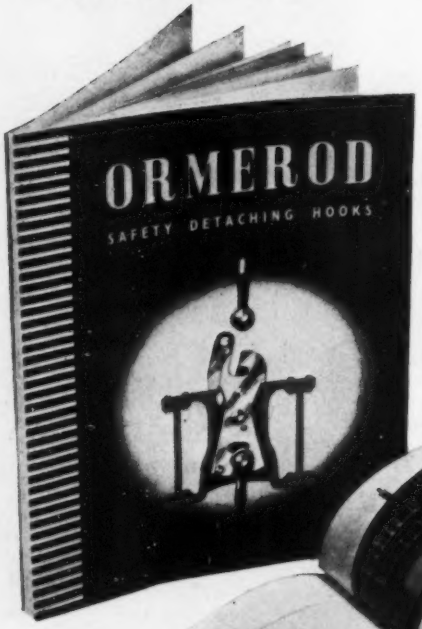

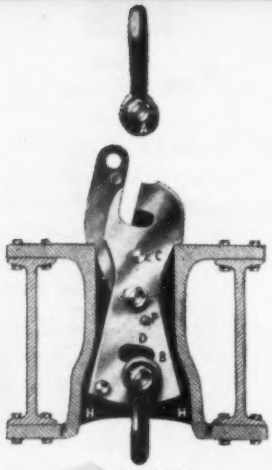

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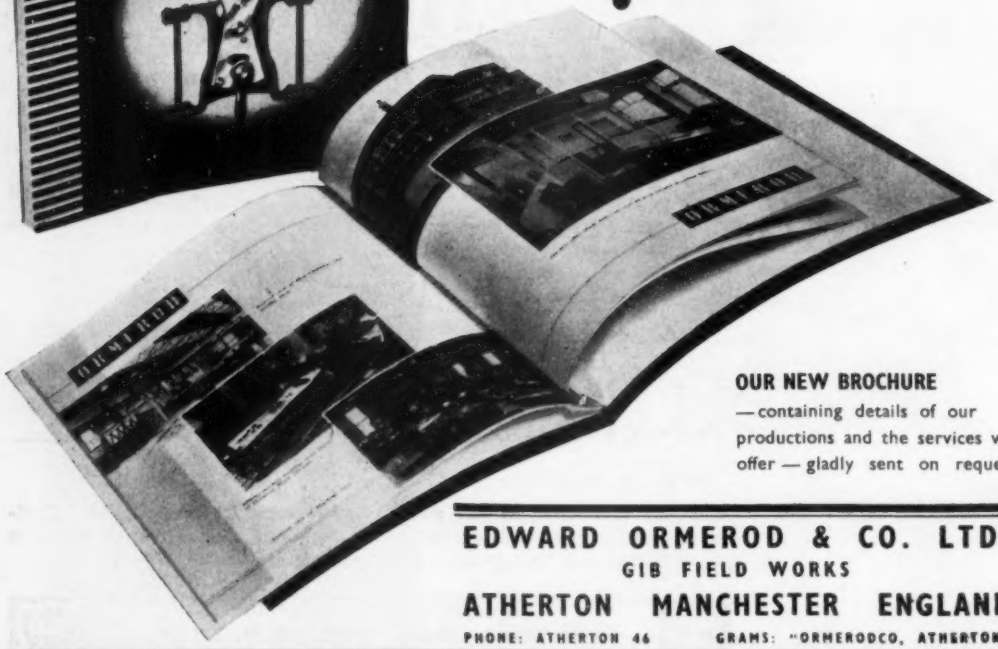

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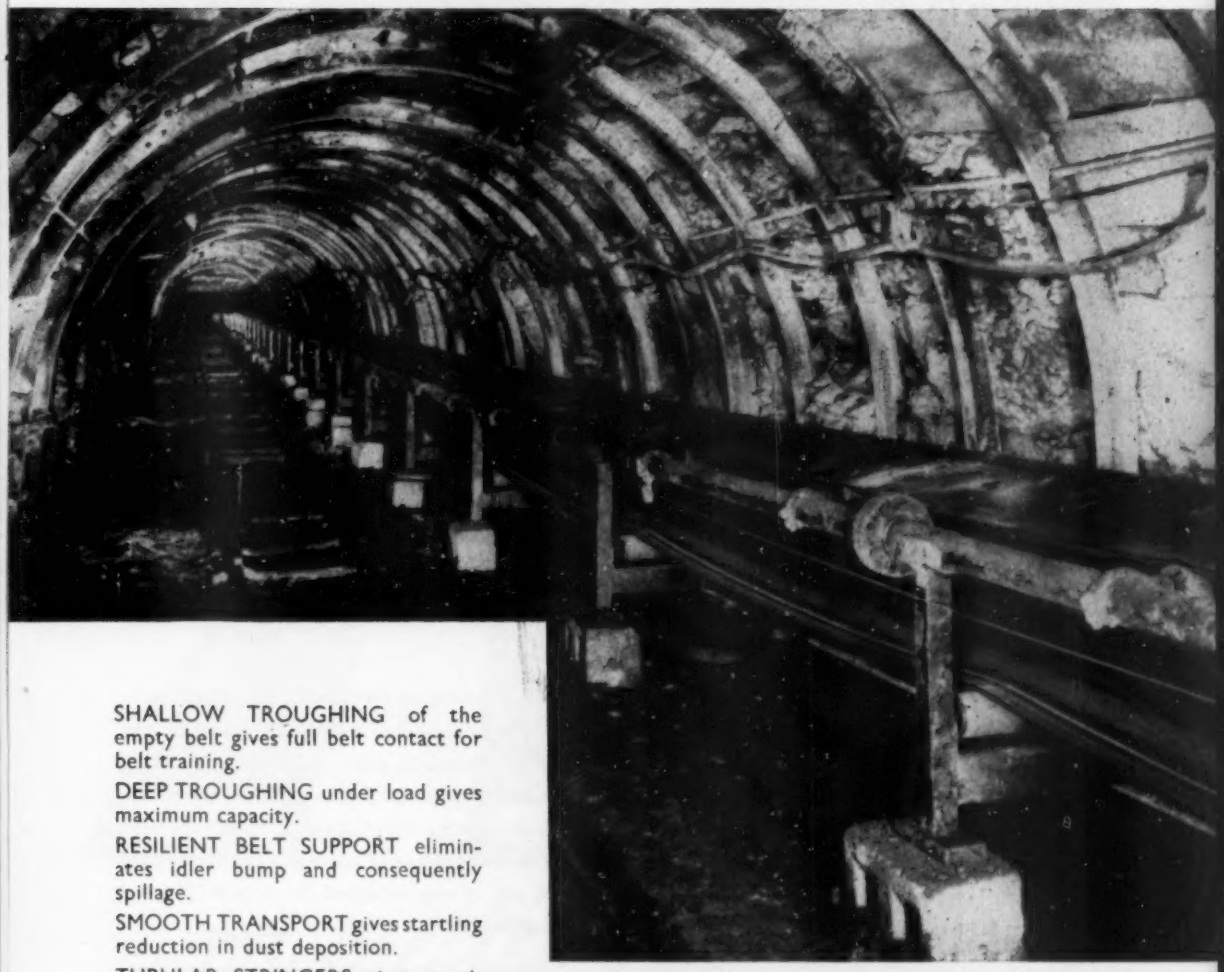

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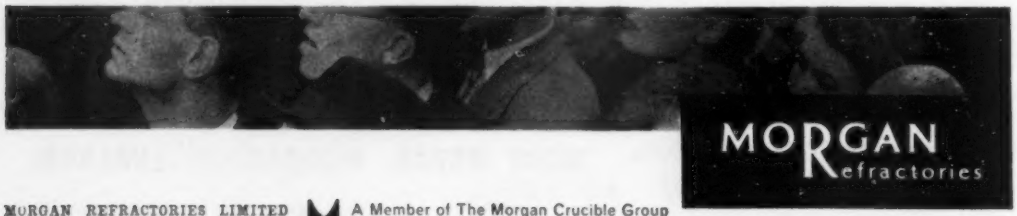

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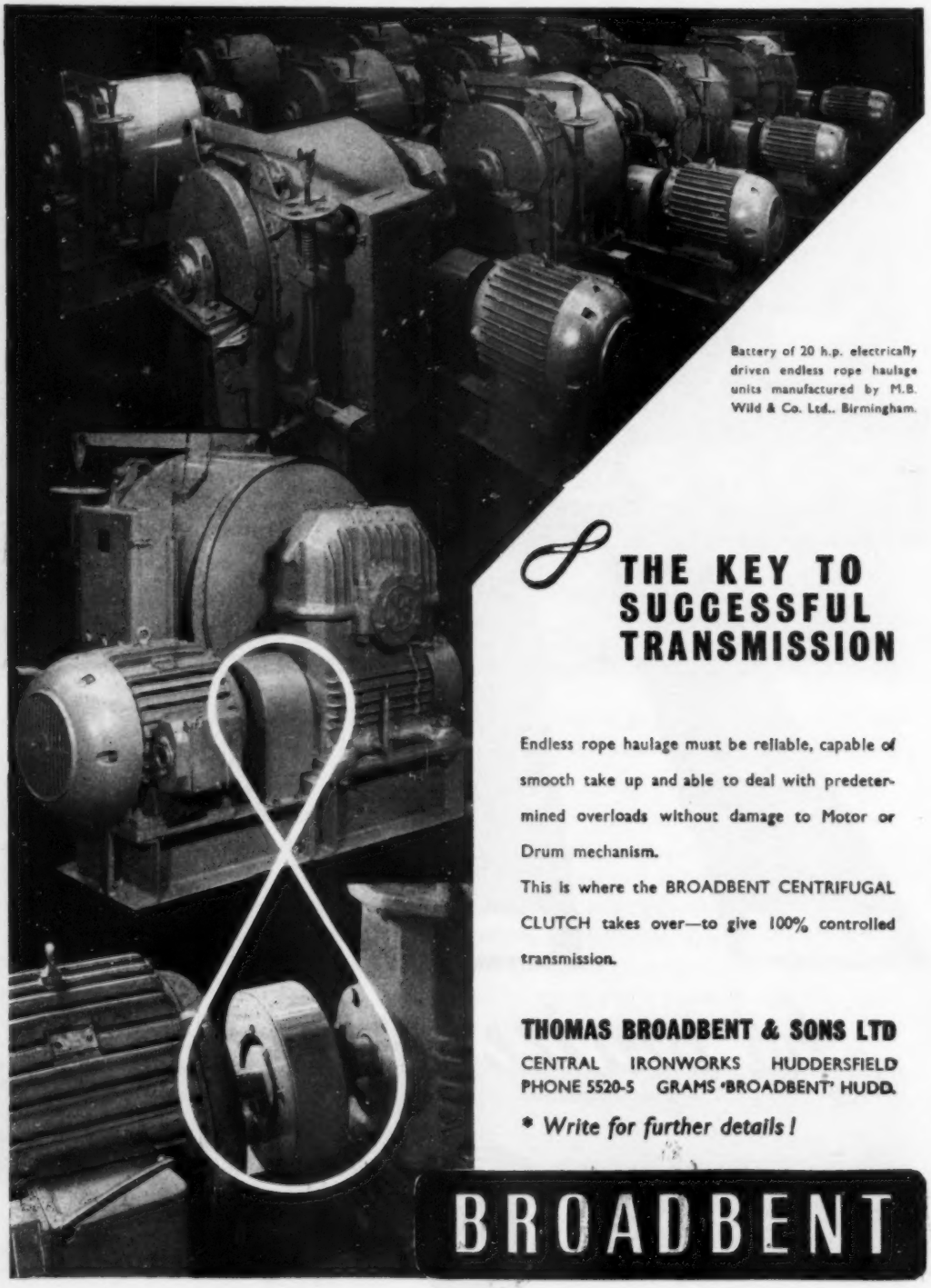

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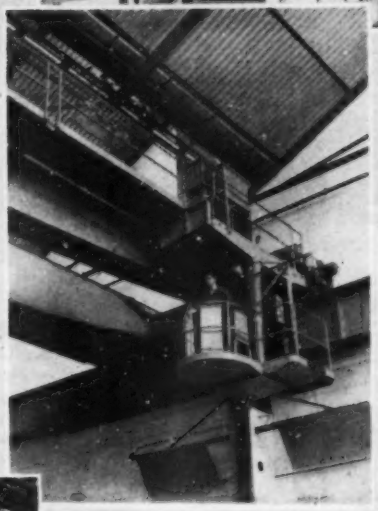

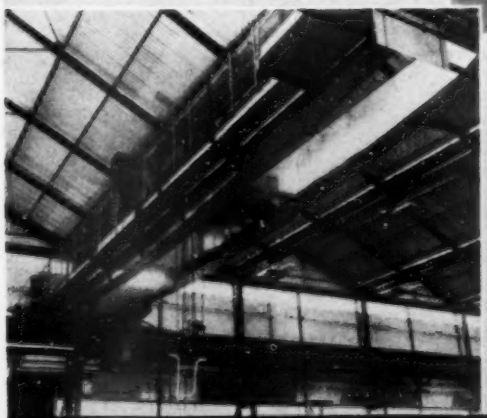

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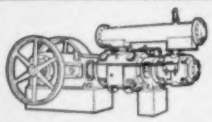

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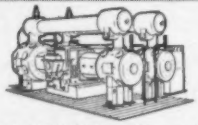

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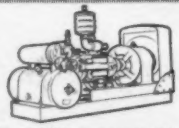

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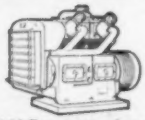

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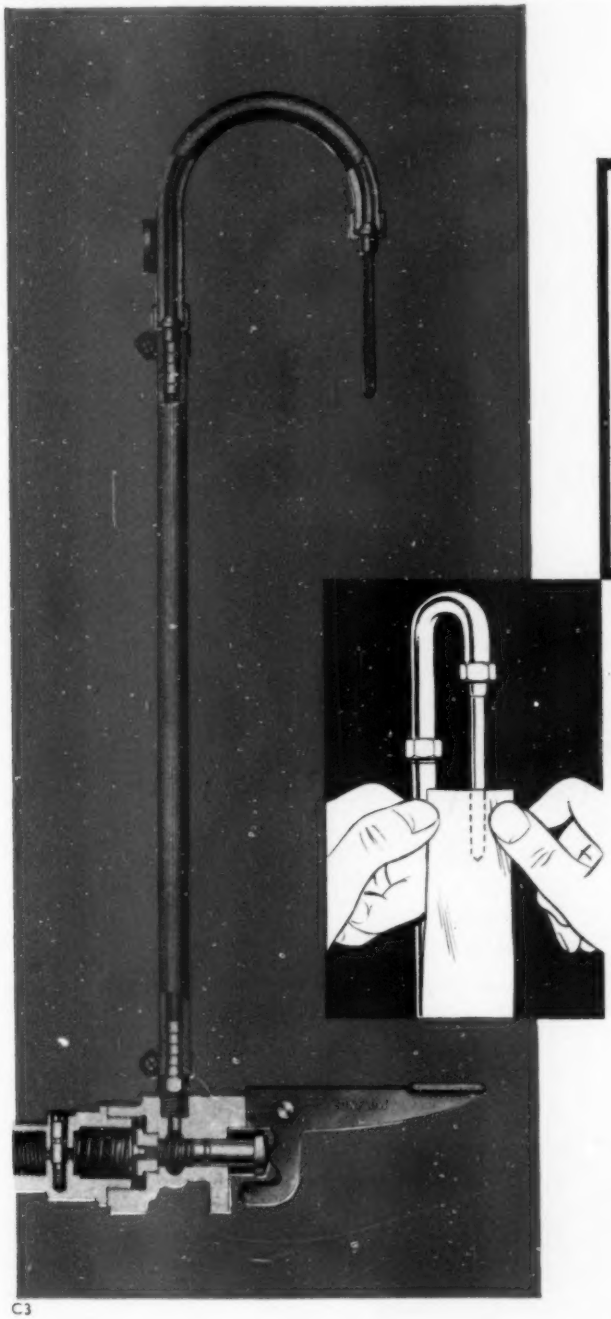

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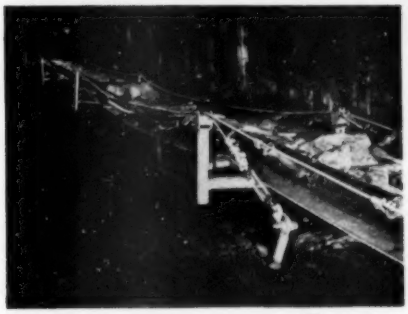

(above and left) Fed by a gathering arm loader, this 30" rope belt conveyor at Calverton Colliery is loading out stone.

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(right) Ropebelt Structure showing the increased wing angle of the idler assemblies under load. The steel framework of a drive section in the background is not part of the standard belt structure.

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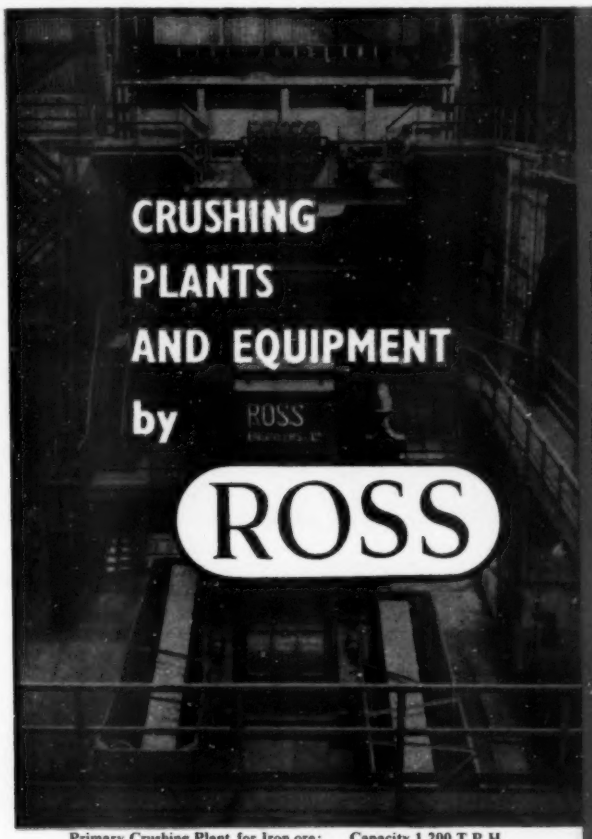

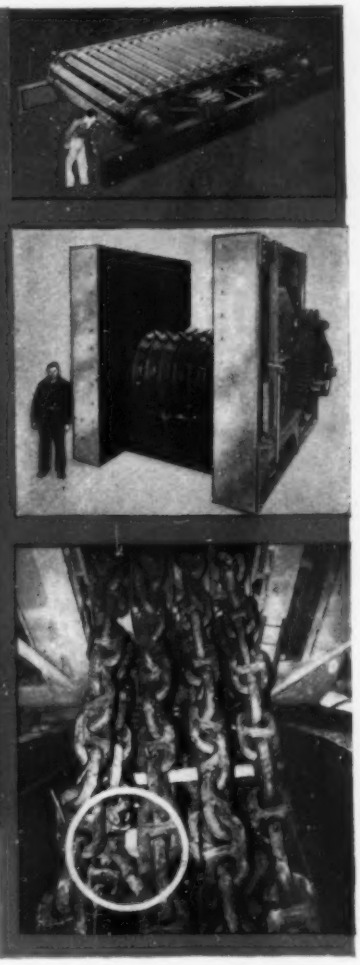

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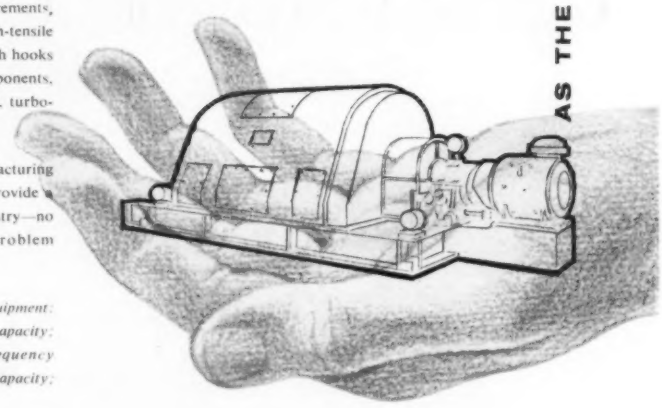

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No. 4873

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DECEMBER 8, 1961

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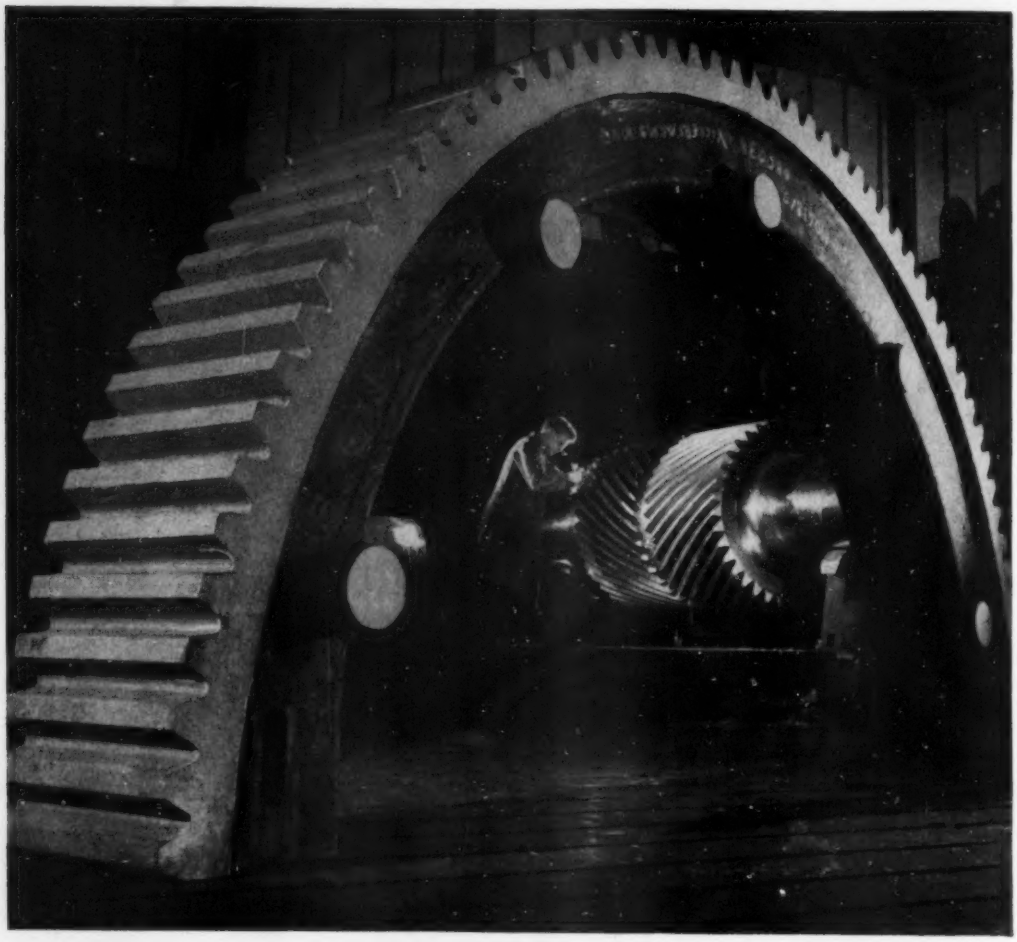

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IRON & COAL
THE IRON AND COAL TRADES REVIEW
Vol. 183 December 8, 1961 No. 4,873

Scrap Industry and the Common Market

WITH negotiations proceeding for the entry of Great Britain into the European Economic Community members of the ferrous scrap industry in the United Kingdom are casting a wary eye on the future. Entry into the Common Market cannot fail to have great consequences for the British scrap processors, and vast changes can be expected in the general trading pattern.

Since the war demand for steel has continued to grow, and so, also has the demand for scrap. Domestic sources of supply have been insufficient to meet steelmaking demands in full, and the balance has had to be imported. This trend was first halted in 1958, when there was a recession in steel consumption and for the first time since 1937 steelmakers were unable to take all the internal scrap made available. As a result, exports were allowed for a period of some six months, and more than 1,000,000 tons of steelmaking scrap was shipped abroad.

By October, 1960, merchants were once more making record deliveries of scrap to steelmakers, and to meet the demand of home consumers it became necessary once again to import material. Now the wheel has turned a full circle; steelmakers are again unable to take all internal arisings, and exports of some grades are again being permitted.

What will be the position of scrap if Britain should eventually become a full member of the EEC? What will be the steel industry's attitude to a free scrap market? These questions are not easy to answer. The facts at the moment are that the British steel industry has welcomed Britain's application to join the Common Market, and it supports the prospect of becoming a full member of the European Coal and Steel Community. The scrap industry, generally, also welcomes the challenge which membership will present, and, although it cannot be said at this stage what the ultimate effect on the scrap industry will be, the view is widely held that it will in the long term be to the advantage of every scrap processor.

During the past year, expansion of steel production among the Six has been fairly rapid, and has led to a general wave of investment by steelmakers in one country after another until it has reached all the steel industries in the Community. According to the latest High Authority figures, it is expected that the crude steel production capacity of its members will reach 96,000,000 tons by 1964; and taking new projects into account, production capacity may reach 108,000,000 tons by 1965-66.

If this capacity is fully utilized, the future of scrap is indeed very promising. On average throughout the Six, scrap's share of the steelmaking charge is around 46 per cent., compared with pig-iron's 54 per cent. In the UK, the percentage of scrap used in steelmaking is currently running at over 50 per cent. One reason for this is that British scrap prices are lower than those in Europe. Even when scrap is imported into Britain, prices to the consumers are maintained at the domestic level by means of the special steel industry fund which meets the cost of imported raw materials.

The steel industry recognizes that any major revision of the British scrap arrangements—and this would be inevitable as members of the EEC—would almost certainly involve some rise in the industry's total cost level. The British scrap industry will enjoy the same free market conditions as its opposites in the Six, where, after the early years of operating a semi-controlled scrap market, the High Authority came to the conclusion that only a completely free market could solve the problems of prices and supplies which were proving difficult. The return to freedom in 1958 did not cause any serious difficulties, despite the large increases in steel production during the following years, and while it has been aided by certain favourable circumstances—the development of oxygen processes and the fall in scrap prices on the American market, among them—there is nothing very serious to fear in the scrap market's long-term future.

Steel Plant Engineers' Growing Importance

SPEAKING at the annual dinner of the Sheffield and district branch of the Institution of Plant Engineers, on Thursday of last week, Mr. T. S. Kilpatrick, director and general manager of Steel, Peech & Tozer, branch of the United Steel Companies, Limited, said that any steel plant was as good as its plant engineers. Though some other industries could make money by clever buying, selling, or advertising genius, the steel industry's sales were made largely at controlled maximum prices.

"If the individual steel company wishes to do better than its competitors," he went on, "it is greatly dependent on skill in designing and maintaining its plant."

ADDRESS OF the Manchester office of the Consett Iron Company, Limited, is now Longridge House, Corporation Street, Manchester 4. The telephone numbers (BLAckfriars 5847/8) are unchanged.

Mr. R. F. Summers to Join Iron and Steel Board

CHAIRMAN of John Summers & Sons, Limited, steelmakers, of Shotton (Ches), Mr. Richard F. Summers has been appointed by the Minister of Power to be a part-time member of the Iron and Steel Board. He will succeed Mr. A. G. Stewart, chairman and managing director of Stewarts and Lloyds, Limited, whose appointment expires on December 31.

MR. R. F. SUMMERS

Mr. Summers, who has been chairman of John Summers since 1938, entered the firm in 1925, was appointed to the board in 1931 and became managing director in 1936. He is also chairman of the Birmingham Corrugated Iron Company, Limited, Burnell & Company, Limited, deputy chairman and member of the London committee of the District Bank, Limited, and a director of a number of other companies. He is immediate past president of the British Iron and Steel Federation and serves on the Midland Area Board of the British Transport Commission.

Park Gate Iron & Steel Company's Prizegiving

PRESENTING prizes to a record number of 422 students and apprentices at the Park Gate Iron & Steel Company, Limited, Rotherham (Yorks), a subsidiary of Tube Investments, Limited, Sir David Watherston, a director of the parent company, said the expansion of the numbers undergoing training at Park Gate was "quite remarkable." Mr. J. Wadsworth, a director and assistant general manager of the Park Gate company, said it was hoped that steel production would begin on the new Aldwarke site during the summer of 1963.

To make sure of an adequately trained labour force, the company had considerably increased its intake of young people in the past two years, and was now operating 13 different training schemes.

PRICE OF TITANIUM CUT

ANOTHER cut in the price of titanium, the sixth since it began production in 1955, was announced on Wednesday by Jessop-Saville, Limited, Sheffield, the steel division of the Birmingham Small Arms Company, Limited. The reduction is approximately 10-15 per cent. on most titanium products, and will take effect about the end of the year.

Sales director of Jessop-Saville, Mr. J. F. Wallace, said that increasing output and improvements in production techniques were reducing costs, and these savings were being passed on to customers. The latest reduction means that the price of the metal has been cut by more than a half in six years.

Passing Thoughts . . .

"I CAN see the attraction of the boat trip to Australia or South Africa for the higher executive, but does he not tend to talk to men of his own age, who are already set in their ways, and thus give a wrong impression of what the market wants? Surely it is the younger generation who mould the tastes and needs of tomorrow?—MR. ROGER FALK, a director of Production-Engineering, Limited, speaking at the Royal Society of Arts.

What is needed to boost exports today is the use of experienced men, not necessarily at director level, but men with senior management experience. —Letter in the Financial Times.

The hard core of the leaders of British industry today have come up from the shop floor. In caste-conscious Britain that in itself is enough to explain the striking absence of graduates in many parts of industry. . . . In many of the country's older industries graduates are rare, unsought, and sometimes unpopular. —The Economist.

There are few better therapeutic agents than routine hard work and, like Mr. Pickwick's cab horse, many of us tend to fall down when taken out of the shafts. It takes a very civilized man to be able to idle gracefully.—SIR DERRICK DUNLOP, *Professor of Therapeutics and Clinical Medicine at Edinburgh University, speaking at the third health conference for executives organized by the Chest and Heart Association.*

Lesson for British Business?

ANY tired British businessman struggling to his office by 10 a.m. should try a spell of duty behind the Iron Curtain, says Mr. Bob Mills, sales director of Bromford Iron & Steel Company, Limited, West Bromwich. Mr. Mills has recently returned from Prague where he has been selling his company's steel to the Czechoslovakian State purchasing organization. After a hard day's bargaining with a representative, the meeting broke up with an arrangement to meet again the next day.

"What time shall I come and see you?" asked Mr. Mills. "Would eight o'clock be convenient?" queried the Czech, adding, "I'm sorry I cannot make it earlier but my English lesson is at 6 a.m., and finishes only just before eight."

We have, I think, all learnt a great deal since the bad days of the early '30s about the waste of reckless unfair price-cutting in a highly capitalized industry such as steel.—MR. C. R. WHEELER, president of the British Iron and Steel Federation.

Profits and patriotism go hand in hand; and the more that people look at a policy of exporting the more they will find there is profit in it.—SIR KEITH JOSEPH, *Minister of State, Board of Trade.*

Mr. Richard Wood says that he has "advised" Lord Robens of the Government's views on the pay pause, but that he is "dubious" of his powers to direct the board on wages. So he has given no "direction." If in spite of the Government's advice, Lord Robens and his board think fit to make concessions, will the Government pay? Is the nationalized coal industry subject to Parliament or not? The present uncertainty is unsatisfactory to everyone.—The Guardian.

Ironstone Inquiry

RTB APPLICATION WAS "HANDLED EFFICIENTLY"

THE Council on Tribunals has answered criticisms by Lord Lucas of Chilworth, of the Oxfordshire ironstone mining inquiry which was held at Banbury last November into a plan by Richard Thomas & Baldwins, Limited, to mine iron ore south of the town. The firm's application was rejected in May. The Council, which investigated the proceedings at the request of Lord Lucas and Oxfordshire County Council, says in its report that the inquiry was handled efficiently by Mr. H. F. Yeomans, the Ministry of Housing and Local Government inspector, and that the proceedings call for no adverse comment.

The précis of evidence and the inspector's report both indicate that the steel company's case was bad, and that it had little chance of success in its application for planning permission to quarry ore for its £119,000,000 steelworks being built at Newport (Mon).

"The fact, however, remains," says the report, "that the opponents clearly felt that they were up against a sinister endeavour to force through planning applications, involving eventually the compulsory acquisition of, and irreparable damage to, over 4,000 acres of land in Oxfordshire." The case therefore underlined the importance of an adequate code of procedure for planning inquiries of this nature.

"Pressure" on Minister

Lord Lucas's comments, made in the House of Lords, on the "unsatisfactory" features of the inquiry, are dealt with in detail by the report. The main complaint against the inquiry was that the Minister of Housing and Local Government was under pressure to grant planning permission for two reasons: because the firm had spent a large sum on equipping its proposed steelworks at Newport in anticipation of a favourable decision; and because the Government had a financial interest in Richard Thomas & Baldwins.

The Clerk of Oxfordshire County Council said in a letter to the Council on Tribunals that the inspector should have given an assurance at the inquiry that no weight would be attached to the Government's interest.

The Council on Tribunals says that in its view the inspector was under no duty to refer to the firm's expenditure. "An inspector reports to the Minister on the evidence laid before him." It was not for the inspector to give any assurance of the kind suggested by the county council. But the Council on Tribunals feels "that where the Government has a specific financial interest in an application of this kind there are special arguments in favour of appointing an independent inspector."

A further objection was that the inspector did not state at the inquiry that the Minister would not consider new evidence from the steel company in private. On the fact that no order was made about opponents' costs, the report says the whole question of costs in planning inquiries is a difficult one, and it is understood the Council will be asked to consider it specially.

MAGCO, LIMITED, manufacturers of vibrators, vibrator conveyors, etc., has moved its London office to 132-135, Sloane Street, London, S.W.1 (telephone: SLOane 9976).

German Iron and Steel Institute

EVIDENCE of the widespread interest of the technical section of iron and steel industry in the activities of the German Iron and Steel Institute was manifest at the annual meeting held recently in Düsseldorf. There were over 5,000 members and guests present, including some 250 visitors representing 17 nationalities. The attendance was about the same as last year when the institute celebrated its centenary.

The technical sessions were a feature of the gathering and were attended by between 750 and 2,000 at each group, a total of 20 papers being presented. These covered topical themes in the fields of ironmaking, steelmaking, hot working and cold working, the authors dealing with a number of new techniques and developments such as the production of sponge iron with natural gas in shaft furnaces, the continuous thermo-electric measurement of the temperature course in oxygen blowing processes, the extrusion of steel shapes, and the experience gained on new works installations, *e.g.*, a new semi-continuous intermediate mill and a new high-speed cold tandem mill.

Of particular interest was the discussion by one group of plant layout and operation in steelworks, principally in relation to the future application of automation not only to rolling mills but also to blast furnaces and steelworks. Another group directed discussion on the properties of vacuum-treated steels, papers presented dealing with vacuum treating of mild steel, the transformation behaviour of various vacuum-treated plain carbon heat-treating steels, the refining of plain carbon and alloy steels in induction, and arc-vacuum furnaces, and on experiments in the production of alloy steels in arc vacuum furnaces.

Dr. Kurt Thomas, secretary of the Institute, and Dr. Hermann Schenck, chairman, were among the speakers at the general meeting on the second day of the gathering.

IN THE 11 months ended November 30, 1961, a record number of 66,202 Fordson tractors were produced at the Dagenham (Essex) factory of the Ford Motor Company, Limited, and in the 10 months to October 31, 1961, total sales exceeded last year's record for the same period. While exports of tractors to Europe have increased, total export sales to the world market have shown a fall of 2.4 per cent. Since production began at Dagenham in 1933, well over 500,000 tractors have been exported.

Personal

Firth-Vickers Steel Expert Retires

SPECIAL director and foundry general manager of Firth-Vickers Stainless Steels, Limited, manufacturers of heat and creep-resisting steels, etc., of Sheffield, Mr. A. E. THORNTON is, on medical advice, and at his own request, retiring at the end of the year. He has been with the company, and its parent, Thos. Firth & John Brown, Limited, for 45 years.

Mr. Thornton, who received his metallurgical training under Dr. W. Hatfield at the Brown-Firth Research Laboratories, took an associate degree in metallurgy at Sheffield University. He later specialized in the process development and manufacture of stainless and heat-resisting steels. At the outbreak of the last war, he was seconded to Firth-Vickers as general manager of the firm's foundries in Sheffield, Birmingham, and Barnsley, becoming a special director in 1946.

An honorary Fellowship of the Manchester College of Science and Technology has been conferred on Lord CHANDOS, chairman of Associated Electrical Industries, Limited.

MR. G. B. TAYLOR, a director of Rhymney Engineering Company, Limited, has been appointed general manager. He succeeds Mr. G. W. Davidson, who has retired from business.

MR. BRIAN GILDING, deputy head of research, Yorkshire Imperial Metals Company, Limited, Leeds, has been awarded a Ph.D. degree in metal physics by the University of London.

Mr. W. R. HAWKINS, finishing department manager at the Cargo Fleet Works, Middlesbrough, of the South Durham Steel & Iron Company, Limited, has retired after 50 years' service.

Chief surveyor, No. 4 (Alfreton) Area, East Midlands Divisional Coal Board, Mr. L. H. WATSON has retired. He began his career as surveyor at Manners Colliery, Ilkeston (Derbyshire), in 1915.

MR. R. S. ROBINSON, of Tube Investments, Limited, was appointed chairman, and Mr. A. V. ALBUTT, deputy chairman, of the new Midland Regional Board of the Institution of Works Managers, at its first meeting in Coventry on Wednesday of last week.

Mr. A. KENNEDY AITKEN is to retire as a director of R. & J. Dick, Limited, manufacturers of belting, of Glasgow. He was a former managing director of the company, relinquishing the position in 1955.

Chairman of Ward & Payne, Limited, manufacturers of edge and mechanics' tools, etc., of Sheffield, Mr. ARCHIE HATTERSLEY is to fly to Nigeria on a business trip on January 1. His son, Mr. JOHN HATTERSLEY, works director of the firm, leaves three weeks later for a two months' business tour in South Africa.

Yorkshire-born Mr. JIM BULLOCK, who went down the pit at the age of 13 and later became the president of the British Association of Colliery Management, is the subject of "Portrait of a Collier" in the Home Service on Sunday, December 10. He will talk about his life and the profound industrial and social changes he has seen taking place in mining communities.

MR. J. F. D. WOOD, newly appointed sales director of Sanders & Forster, Limited, the standard steel building and structural company of the Chamberlain Industries, Limited, group, is undertaking an extensive sales promotion tour in the Far East, where he will visit the company's agents in Bombay, Colombo, Singapore, and Kuala Lumpur, and also appoint agents in unrepresented territories.

Scottish Pit Closures Defended

"WE believe that, given the circumstances as they are, the course we are proposing is the right one. Indeed, I have yet to see a constructive alternative put forward." This statement was made by Mr. R. W. Parker, chairman of the Scottish Divisional Coal Board, referring to pit closures in his division.

MR. R. W. PARKER

Speaking at a luncheon of the Edinburgh City Business Club on Tuesday, Mr. Parker agreed that the greatest concern had arisen from the board's decision to stop production at two of the new ventures—at Glenochil and the top horizon at Rothes. Inevitably, he said, people wondered whether the evidence on which the projects were started was adequate and why, if the ventures were not turning out right, they were not stopped before such large sums of money had been spent. "In both cases the best technical opinion accepted the evidence as fully justifying the ventures."

At Rothes, for example, the potentialities of the field had been assessed both from knowledge of workings nearby and from information obtained from a series of deep bores which today would cost almost £200,000 to put down. Although Rothes was started in 1947, it was not until 1957 that the first coal began to come from the pit. By that time the board had spent £7,000,000 out of the total expenditure of £8,750,000 on capital account. So the bulk of the money had already been spent before working and exploration could reveal the information which no bores could show—namely, the local working conditions of the seams in the upper horizon.

With such a weight of initial expenditure involved it was essential to be sure that the difficulties were extensive, and not merely local, before there was any question of abandoning a whole district such as the upper horizon at Rothes. That, in turn, took time and money.

Mr. Parker went on to say that unless production was to be allowed to get out of relation with demand, there must be some reduction in other directions. Contraction by virtual exhaustion in 1962 involved nine pits, but they were all small. So the balance of the reduction must come from other pits chosen from those where the prospects were poor, where the stopping of coal-getting would help to improve the heavy financial losses, and where, generally, the opportunities for redeploying most of the men would exist.

Referring to performance in the Scottish coalfield, he said November productivity at 24 cwt. was the highest for any month since nationalization. Output by power-loading had grown from 4 per cent. in 1955 to almost 40 per cent. this year. "That is not the picture of a dying industry," he said.

MR. JOHN C. MASTERS, northern area sales manager for the Univac computer division of Remington Rand, Limited, has moved to Manchester to begin organization of the Univac computer centre there.

Great Future for Coal

OPPOSITION LEADER'S OPTIMISM

FIRST chairman of the National Coal Board, Lord Hyndley, and the present chairman, Lord Robens, supported the Leader of the Opposition, Mr. Hugh Gaitskell, at the monthly Coal Industry Society luncheon held in London on Monday. In his speech, Mr. Gaitskell paid a warm tribute to the remarkable contribution Lord Hyndley had made to the industry and the State as chairman of the NCB and said that the two chairmen had much in common. One had had to face the storms of the early years of coal nationalization; and the other was now facing the difficulties of " one dam' thing after another " which crowded upon him today.

Mr. Gaitskell recalled that the last occasion on which he had addressed the society at a luncheon was in 1947 when he was Parliamentary Secretary for Fuel and Power—" and what a year that was " he recalled, adding " and what a change since then!" It was a year of crisis and none of them could possibly have imagined that in such a short period they, in the industry, would be concerned not with shortages but with excess.

They had set out to do a great deal and, looking back, he saw that a great deal had been done. An astonishing percentage of coal was now obtained by power loading, compared with the days when they had one power loader—a Meco-Moore—at a Nottinghamshire pit.

Investment and Production

In the last four years the total amount of investment in the industry was equal to the entire amount invested in the inter-war years. OMS now touched 30 cwt. overall—a 50 per cent. increase since 1946—and he did not think they need fear comparison with many other industries. There had been increased investment and increased production. Finance? Perhaps not so good; but they must be careful when referring to the figure of accumulated loss of £70,000,000. Most of the loss had been incurred in the past two years when coal was concerned with the extraordinary competition from oil, and there had been some stagnation in industry; it had also had to bear certain costs arising from price control. It also should be remembered that in setting up a very large organization of this kind they were bound, for good technical reasons, to run into a lot of teething troubles.

Speaking of wages, Mr. Gaitskell said: " I am not interfering in your negotiations, Lord Robens, but as we know some 150,000 men have left the coal industry. I don't think they have left it because the wages were too low or too high. They have left it in circumstances which could not be avoided." But, he reminded his audience, " You have to pay substantial increases in wages to get people to do jobs which are less attractive than others."

They should not be too concerned about the competition from oil. " I have no doubt in this country our indigenous fuel must be, after all, the basic thing on which we are going to run our industry and the country." He could understand the deep concern at the increase in the imports of fuel oil, but he did not think they could adopt a crude line of protection. In the long run that would not pay. But it was reasonable to try to extract from " the Government of the day "—and in using that phrase he was giving a certain pledge for the future (laughter)—how much coal it wanted the industry to produce.

He regretted that the decision to import methane was taken as soon as it was. He thought it would have been reasonable to have an inquiry into the relative costs of this and other systems.

The speaker went on to maintain that the Government and not the industry concerned should carry the financial burden where decisions were taken on broad social grounds, although he felt that the House of Commons should not interfere too much on the day-to-day working of the industry.

Finally, Mr. Gaitskell said he thought coal had a great future " so long as you can sell it "—in other words, it depended upon price. Contraction had been carried out in a planned and humane way. " We can have and shall have in the future a more efficient industry with a steadily improving, highly mechanized, highly paid labour force—you can't have it otherwise.

" It is still our greatest basic industry and it must be successful if we are to prosper. A great many men have devoted and are devoting the whole of their time to that end. We were exceptionally lucky in the first chairman of the NCB because I think Lord Hyndley was able to create within the board the right atmosphere from the start and establish the right relationships. Equally the Coal Board is fortunate in having as chairman a man of very broad experience, immense drive, an extraordinary clear head, and great courage. Under the leadership of Lord Robens this great industry will prosper and flourish."

Coal Industry Is Not Being Contracted Lord Robens

CLOSURE of 17 collieries in Scotland is not the beginning of a general programme to shut down pits, Lord Robens, chairman of the National Coal Board, says in an interview with Coal News, the monthly newspaper of the NCB. The board was not contracting the industry, but going all out to maintain output at 200,000,000 tons next year. Of Glenochil, the relatively new mine which is being closed, Lord Robens says: " Glenochil was a mining failure. I am not going to make any pretence about this, nor am I defending anyone."

Lord Robens says that mechanization is the key to marketing success and job security for everyone in the industry. Some pits will always be closing because of natural exhaustion. " If it was not intended to close old pits we should never have built new ones," he adds, and rejects the idea of a public inquiry into the Scottish closures.

Board Changes

North British Rubber Chief Steps Down

MANAGING director of the NORTH BRITISH RUBBER COMPANY, LIMITED, Edinburgh, Mr. Foster M. Stewart (55), is to retire from the position at the end of the year, in order to devote more time to other business interests. He will remain a member of the board.

MR. F. M. STEWART

Mr. Stewart will be succeeded as managing director by Mr. E. A. Martin, at present works director. After completing the company's £3,000,000 rehabilitation and modernization programme, which included the introduction of advanced new plastic and rubber products, Mr. Stewart hands over to the management team he organized, the future objectives of the company.

BUTLER MACHINE TOOL COMPANY, LIMITED—Mr. H. S. Mitchell has retired from the board.

BRITISH STEEL CONSTRUCTIONS (BIRMINGHAM), LIMITED—Mr. J. W. Sharp has been appointed a director.

BAIRDS & SCOTTISH STEEL, LIMITED—Mr. A. O. Cox has been appointed to the board and has become commercial director.

GLOVER & MAIN, LIMITED—Mr. V. Stott, managing director of Jas. Stott & Company (Engineers), Limited, a member of the group, has been elected to the board.

GRAHAMSTON IRON COMPANY, LIMITED, Falkirk—Mr. W. T. Mitchell has been appointed chairman and Mr. H. C. Stewart and Mr. R. Gardner joint managing directors.

FLUIDRIVE ENGINEERING COMPANY, LIMTED—Mr. Antony Vickers, a founder of the company, will as from January 1 continue to serve the board but as a non-executive director.

GASCOIGNES (READING), LIMITED—Mr. J. A. C. Kingston has been appointed joint managing director, with Mr. G. H. Gascoigne. Mr. H. H. Butler has been appointed to the board.

LOEWY ENGINEERING COMPANY, LIMITED—Mr. E. R. Henschker and Mr. R. M. L. Elkan have been appointed directors of the company, a member of the engineering division of Tube Investments, Limited.

GRIFFIN & GEORGE (SALES), LIMITED—Mr. Martin Lyth has been appointed director of supplies. He was formerly managing director of the subsidiary, Griffin & George (Scientific Instruments), Limited.

BRITISH THERMOSTAT COMPANY, LIMITED—Mr. Robert Broadbent has joined the board of the company, the parent of the Teddington group, as executive director. He has also been appointed chairman of Teddington Autocontrols, Limited, Teddington Controls (Exports), Limited, and P. W. Baker & Sons, Limited, and has joined the board of Teddington Aircraft Controls, Limited. Mr. C. S. Gardner, managing director of Teddington Aircraft Controls and Mr. R. H. Seward, managing director of Teddington Autocontrols have also joined the board of the parent company.

DORMAN LONG & COMPANY, LIMITED—Previously financial director, Mr. James Jack has been appointed managing director, group finance and administration. Mr. Thomas Young has been appointed secretary of the company.

VICKERS SPERRY RAND, LIMITED (formerly Stein Atkinson Vickers Hydraulics, Limited)—Mr. F. J. Everest has been appointed managing director in succession to Mr. C. H. Williams who has resigned from this office, but remains as chairman of the board.

STEELS PROCESS PLANTS, LIMITED—Mr. K. B. Ross has been appointed managing director of the new company which is a member of the Steel & Company, Limited, group. Mr. R. Olley has been appointed engineering director and Mr. R. A. Chasseaud, marketing director.

PYROTENAX, LIMITED—Mr. F. W. Tomlinson, managing director, has been appointed chairman of the company. He will continue as managing director. Sir Brograve Beauchamp has resigned from the chairmanship having held the position for 25 years, but will remain a director.

DARLINGTON & SIMPSON ROLLING MILLS, LIMITED—Mr. E. T. Judge, who is chairman of Dorman Long & Company, Limited, and managing director of Dorman Long (Steel), Limited, has been appointed chairman. It was stated in error in last week's issue that Darlington & Simpson Rolling Mills was a subsidiary of Dorman Long.

AMALGAMATED ANTHRACITE HOLDINGS, LIMITED—Mr. P. E. Holden has been appointed chairman in succession to the late Mr. J. Waddell, and chairman of the subsidiary companies of which the late Mr. Waddell was chairman. Mr. F. S. Bowles and Mr. W. G. Henton have been appointed directors of the company and of British Anthracite Company, Limited.

GENERAL ELECTRIC COMPANY, LIMITED—Mr. A. J. Scamp has been appointed personnel director as from January 1, with a seat on the board. He has been released by Massey-Ferguson (United Kingdom), Limited, with which he is director of personnel and industrial relations. He relinquishes his directorships of both Massey-Ferguson and F. Perkins, Limited, as from December 31.

S. E. OPPERMAN, LIMITED—Mr. Angus Murray, managing director of the Export Tool Group, Limited, has been appointed chairman of the recently acquired subsidiary. Other directors of the reconstituted Opperman board are:—Mr. L. J. Thomas (managing director), Mr. A. J. Heasman, and Mr. C. H. B. Greenwood. Mr. R. Ball and Mr. D. Battle have resigned from the board of Opperman

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"Sleepy England" Must Wake to Common Market Challenge

WITH entry into the Common Market so near, "sleepy England" must awake to meet the challenge represented, said Mr. E. Nicholas Hall, chairman of Hall & Pickles, Limited, steel tool and wire makers, and steel stockholders, of Manchester, last Friday. Saying that England was always at her best in adversity, he went on: "It is up to us within industry to maintain the present high standards of our products and at the same time to keep our prices competitive against our challengers. With these aims in view, England has little to fear."

Mr. Hall, a grandson of the founder of the company, was speaking after presenting watches to 15 of the firm's employees, which brought the total number of watches presented to employees with 25 years' continuous service to 145.

French Steel Plan

GREATER USE OF OXYGEN PROCESSES

From our Special Correspondent

COMMISSION responsible for working out the fourth development plan for the French steel industry is putting the final touches to its report, which is due to be published this month. Its conclusions, after 10 months' deliberation, confirm earlier assessments that demand for steel by 1965 will be between 22,000,000 and 24,000,000 ingot tons a year, according to economic conditions, and that the plan must therefore provide for a capacity in the region of 25,000,000 ingot tons.

Original assessments of steel requirements, made on the basis of a 5.5 per cent. increase in the gross national product and a corresponding increase of 1.3 per cent. in steel needs, has been checked by working out the probable needs of individual steel-using industries. The resulting home demand for ordinary steel was thus estimated to be between 16,500,000 tons and 17,400,000 tons.

Demand for special and alloy steels is expected to be in the region of 1,880,000 tons to 1,950,000 tons, giving a total estimate for the home market of between 18,400,000 tons and 19,300,000 tons. In addition, net exports are expected to be between 3,590,000 tons and 4,750,000 tons.

More Rolling Capacity

Most notable feature of the plan is the development of oxygen processes of steelmaking over the next few years. Between 1961 and 1965, oxygen steel capacity is to increase from 400,000 tons to over 6,000,000 tons, the processes used being the LD, the OLP (Oxygen Lime Powder), and the Kaldo. Thomas steel capacity is to be maintained at its present level (near 11,000,000 tons); several existing converters are to be replaced or enlarged, and two new converters brought into operation. By 1965, most Thomas steel will be blown with oxygen enriched air. Oxygen consumption for all these uses is expected to reach about 700,000,000 cu. metres by 1965, over half of which will be produced in the steel industry's own plants.

Production capacity for open hearth steel is to be increased by modernization of existing furnaces and construction of three new ones, while a big effort is also planned to develop capacity for electric steel. This implies construction of 26 new furnaces, partly to replace existing plant. Most of these furnaces are to be used for production of special alloys. Two are to replace open hearth furnaces which produce mainly steel for stainless tubes. The share of each production process in total steel output by 1965 is expected to be: Thomas, 43.2 per cent.; oxygen, 24.9 per cent.; open hearth, 22.1 per cent.; electric and other, 9.8 per cent.

While under the two previous plans the main effort was directed towards increasing metal production capacity, the fourth plan provides for a big increase of rolling capacity. This is to be achieved partly by improving existing equipment, but mainly by bringing into operation new rolling mills. Among new units planned are six blooming and/or slabbing mills, two continuous strip mills for sheet, three continuous strip mills for narrow strip, two continuous wire rod units, three continuous merchant bar mills, two continuous billet mills, and two quarto plate mills. A number of cold rolling mills, and production lines for galvanized, electro-zinc, and aluminated sheet, as well as tinplate, are also planned.

The commission foresees no serious difficulties in raw material supplies for the programme. Coke requirements of about 16,500,000 tons can be covered by home resources and imports. As for coke dust and other solid fuel used for agglomeration, the supply from home sources is expected to be inadequate to cover the 1,800,000 tons required, although progress can be expected in the field of fuel saving and production of semi-coke. New sources of imported low volatile slacks have therefore to be contemplated.

The main source of iron ore will remain the Lorraine mines, special attention being directed to the development of the use of siliceous ores which, at the moment, are being charged at the rate of only 27 per cent. into French blast furnaces. The scrap supply is also expected to prove easy, with imports from outside ECSC countries remaining at the 1961 level. The average consumption of scrap per ton should be 350 kg. in the steel shops and 50 kg. in the blast furnaces.

The commission lays particular stress upon the need to increase agglomeration capacity in the years to come. This capacity is to reach 27,000,000 tons in 1965 in order to enable most blast furnaces to operate with a high—and sometimes a 100 per cent.—proportion of agglomerate. Injection of liquid and gaseous fuel oils should also develop so as to increase productivity of the existing as well as of the planned blast furnaces. The blast-furnace construction programme provides for 12 new units, seven of which will have a crucible diameter of over 26.5 ft. Seventeen existing blast furnaces are to be reconstructed and modernized. Average coke consumption is expected to go down to 850 kg./ton of pig-iron in 1965, compared with 1,000 kg. in 1959, and 980 kg. in 1960.

Ajax Furnace Record at Appleby-Frodingham

RECORD of 6,068 ingot tons of steel was made by the "B" Ajax furnace in the Frodingham melting shop of Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited, during the week ended November 20. The previous record was a make of 5,944 ingot tons in the week ended April 30 last year.

The new record is not far short of double the record achieved 10 years ago when the furnace produced 3,419 tons in the week ended October 13, 1951.

Law Cases

Wire Rope Pact: Extension for Statement of Case

APPLICATION by the Wire Rope Manufacturers' Association for an extension of time in which to deliver the statement of case for its agreement, due to be considered by the Restrictive Practices Court, was allowed on Monday by the court president, Mr. Justice Russell. While "reluctantly" prepared to extend the delivery date for a further eight weeks, he said that the court wanted to make it clear that this was the last extension the association had any hope of obtaining. If the statement was not delivered by the end of the extension, its whole case would go by default.

For the association, Mr. Eric Walker said there were special circumstances for the application. There were another two associations dealing with wire ropes. The Lock Coil Rope Association was allowed an extension of delivery and its statement was filed on October 4. The Mining Rope Association was also allowed an extension and its statement was filed on November 20. The appellant association had been allowed three extensions, and the court had refused a further one.

Mr. Walker said that the leading counsel originally in the case had been elevated to the Bench and the present leading counsel was now before the court in another case. A first draft had been prepared and it was hoped it would be submitted to the 35 members of the association. He could not really expect to get their approval until the Christmas vacation, and amendments would undoubtedly be made.

Permanent Magnet Association

DANGER to important co-operative research work carried out by the Permanent Magnet Association if the agreement between members were to be ended was stressed by Mr. T. G. Roche, QC, in his opening speech before the Restrictive Practices Court and amplified by members of the PMA. If the price restrictions were removed and everybody was free to charge what they liked, the members were unanimous that there could be no pooling of future patents, exchange of know-how, and co-operative research, he said, concluding his speech.

One of the members of the association, Mr. Philip Neill, a director of Jas. Neill & Company (Sheffield), Limited, said that if the agreement came to an end, but co-operation on research and pooling of knowledge continued, his company would resign from the association.

His company's exports would probably be affected detrimentally if the agreement came to an end because there would not be the same technical co-operation. If members within their own research units withdrew from the Central Research Organization it would be "only a shadow of its real self."

Dr. G. F. Tagg, research manager of Evershed & Vignoles, Limited, electrical instrument makers of London, W.4, listed performance and stability as the main features of a permanent magnet. Quality was of the utmost importance. Evidence was also given by Mr. H. S. MacAdie, technical director of Avo, Limited, London, S.W.1.

The hearing which continues has heard Mr. J. B. Peile, joint managing director of Turton Bros., & Matthews, Limited, Sheffield, and Mr. J. E. Gould, director of research for PMA.

HAPHAZARD WARNING SYSTEM

AT Nottinghamshire Assizes Mr. Bernard Allen (58) was awarded £1,750 damages and costs against Stewarts and Lloyds, Limited. He alleged negligence resulting in the fracture of his ankle while at work six years ago. It was stated that while working at the company's ironstone quarry at Glendon, near Kettering, a piece of clay fell from the quarry face on to his ankle. It was claimed that the firm had no proper look-out to warn the men of falling clay.

Giving judgment, Mr. Justice Cairns said that the warning system, whether it was laid down by the employers or had been adopted by the workmen, was too haphazard. He granted a stay of execution for the defendants to consider the question of appeal.

MINER'S £3,000 AWARD

MINER whose head was trapped during a roof fall at Blairmuckhill Colliery (Lanarkshire), was awarded damages of £3,000 against the National Coal Board in the Court of Session, Edinburgh. The miner, Mr. William Hamilton, told Lord Wheatley that when he arrived for duty on June 6, 1958, he found a line of temporary supports he had erected on the previous shift removed. While taking steps to re-erect the supports, a stone fell from the roof, pinning him by the head to the ground.

Mr. Hamilton claimed the accident was due to the failure of other NCB employees to replace the supports after removing them to allow the passage of a coal-cutting machine. The Coal Board denied liability and said Mr. Hamilton should have taken reasonable care by carefully examining his working place at the beginning of the shift, taking any necessary steps to secure the roof.

The jury held Mr. Hamilton to be 25 per cent to blame for the accident.

DAMAGES OF £3,200 were awarded at Sheffield Assizes to Mr. David Nettleton (19), against Winterbottom (Wiredrawers), Limited, Oxspring, near Sheffield, for the loss of four fingers on his left hand in an accident while working as a wiredrawer for the company.

DAMAGES of £1,050 were awarded to Mr. William Jackson McCracken (37), maintenance fitter, against Glenfield & Kennedy, Limited, valve manufacturers and hydraulic engineers, of Kilmarnock, in the Court of Session, for injuries received in an accident at the firm's works.

THE HEARING HAS BEGUN in the Court of Appeal of the appeal by case stated by the Registrar of Restrictive Trading Agreements from the decision of the Restrictive Practices Court that a new agreement entered into by the Black Bolt and Nut Association of Great Britain was not "to the like effect" as one of the restrictions in its original agreement that had been declared on the reference of the original agreement to be contrary to the public interest.

W. H. DORMAN & COMPANY, LIMITED—Mr. J. W. Whimpenny, managing director, is to resign as from December 31. Mr. L. Johnson, at present development manager, becomes a director and general manager from January 1. The company was acquired earlier this year by English Electric, and Mr. I. MacLeod-Smith, while remaining a director of W. H. Dorman, is appointed joint sales manager of the diesel engine division of English Electric.

In Parliament

COAL BILL REVOLT

No Rise for Miners During Pay Pause

MR. RICHARD WOOD, Minister of Power, made it clear during the committee stage of the Coal Industry Bill that the Government is not prepared to approve a rise for miners while the pay pause lasts, even if output is increased. He was replying to criticism of the Bill by a number of Conservative members, who sought an amendment to reduce from £50,000,000 to £25,000,000 the sum which the Bill empowers the Minister to advance to the National Coal Board, before the end of 1962, for financing any accumulated deficit on revenue account.

The amendment was moved by MR. GERALD NABARRO (Con.). Another amendment, considered at the same time, sought to provide that from any such advances the Minister might recover from the board any amount of wage or salary increases not directly related to increases in productive efficiency.

Mr. Nabarro said the first amendment was designed to bring the Coal Board back to the House for a further examination of its deficit financing at the end of six months instead of 12 months, and the other was associated with the pay pause. Deficit financing of the board was now running the taxpayer heavily and deeply in the red. The deficit or accumulated loss forward of the board at December 31 next would be about £90,000,000, and the Minister had said that the internal funds of the board would probably be about £60,000,000.

Productivity and Wages

Mr. Nabarro said that except for domestic coal, prices were being raised. Sales of coal would be slowed by putting up the price, and the revenue of the board reduced and not increased. This would also lead to a switch to fuel oil. The pay pause meant that if productivity went up, pay might go up, but if productivity did not go up pay must not.

MR. WOOD, replying to the suggestion that the figure of £50,000,000 should be reduced to £25,000,000, said there was no way in which the board could finance its likely gap, in 27 days' time, of rather more than £30,000,000, other than by the provisions in the Bill, and it would not be possible to meet the day-to-day needs which were going to be evident in 1962. The amendment would frustrate the purpose of the Bill.

Mr. Wood said he could willingly give assent to the idea that wages and salaries should not rise out of proportion with the increase in productivity, but the second amendment would not achieve this object, because it carried the implication that the board could grant increases at any time if they were based on increased productivity. If the Government accepted the amendment it would not be unnatural to draw the inference that it would have no objection to increases in wages being granted at once if the necessary conditions of increased productivity were fulfilled. That was not the Government's position. It attached the greatest importance to the pay pause and believed that for the time being there should be no increases at all.

Mr. Nabarro said that what the Minister was saying was that, in the context of the Coal Board, it was not a pay pause but a pay freeze. Mr. Wood said he had argued against an increase on any particular formula in wages negotiations. He had already told the House of the advice he had offered Lord Robens. It was for the board to undertake wage negotiations, not the Minister, in the light of Government advice. The normal procedure would take place in negotiations.

MR. JAMES GRIFFITHS (Lab.) said that in the last four or five weeks the industry's production had been as high—if not higher—than in the same period last year, and there were 24,000 fewer men in the mines. He asked: "What other industry can match that achievement?" If every industry in the country was doing that, the Chancellor would not bother about a pay pause.

MR. HAROLD FINCH (Lab.) pointed out that pitmen's pay had gone up only 6 per cent. in the last four years, while output had risen by 16 per cent. "The miners have done their duty by the nation, and have never been a drag on the economy."

MR. NICHOLAS RIDLEY (Con.) said the amendment would give the Minister some more direct responsibility to take Lord Robens out of this difficult position. It would give him "gentle power" to take to himself responsibility for the policy of the Chancellor.

MR. EMANUEL SHINWELL (Lab.) said the Minister had no power of direction regarding wages. No Minister associated with a nationalized industry had the right to interfere in those matters. MR. T. H. SKEET (Con.) said the wage pause should be a freeze and should be applied generally in order to be effective. There should be very few exceptional cases.

Asked if the Government would sanction an award if it resulted from arbitration, MR. WOOD replied: "That is a hypothetical question which it would be impossible to answer at the present time."

SCOTS PIT CLOSURES

QUESTIONED by Miss MARGARET HERBISON (Lab.) about pit closures in Scotland and the steps being taken to provide alternative work for redundant miners, Mr. NIALL MACPHERSON, Parliamentary Secretary to the Board of Trade, said that for the great majority of men affected alternative work would be made available within travelling distance of the men's homes.

Many of the closures were to take place in development districts, and in steering industry to new localities the Board of Trade was required to give priority to

these districts. The Board was also trying to steer industry to other places affected by the closures, and broadly speaking would issue an industrial development certificate to any suitable firm wishing to go not only to a development district but to any of the districts affected by the closures.

MINERS' SMOKELESS FUEL

REFERRING to the recent agreements which allow coal miners smokeless fuel in place of raw coal, MR. DAVID GRIFFITHS (Lab.) asked if the Minister of Power would direct the NCB to ensure adequate supplies in the regions concerned. He said that in smokeless zones there was difficulty in procuring smokeless fuel.

MR. JOHN C. GEORGE, Parliamentary Secretary, Ministry of Power, said that supplies of smokeless fuel were generally adequate throughout the country and no difficulty was being encountered on a wide scale. There might be local shortages. In connection with the agreement with miners, the board intended, where coal was replaced, that it should, wherever possible, be by coke from its own ovens.

METHANE IMPORTS

REPLYING to criticisms by MR. HAROLD BOYDEN (Lab.) in an adjournment debate on the Government's decision to import methane, MR. JOHN C. GEORGE, Parliamentary Secretary to the Ministry of Power, said that users of gas would not be inconvenienced if supplies of methane from the Sahara were interrupted for political reasons.

The imports would open up a new technology in Britain, he maintained. Gas for export industries would be cheaper, British shipping would be helped, and the study of the Lurgi system would in no way be prejudiced.

Mr. George added that the effect on the coal mining industry would not be serious. It had been estimated that the consumption of coal by the Gas Council might drop by 2 per cent., which was very marginal. It was hoped that consumption of gas would expand, but the only hope of that and of gas remaining an important customer of the coal industry was to have the gas industry competitive. The way to do this was to give it access to this new technology.

FUTURE OF GLENROTHES

ANXIETY about the future of Glenrothes, the Scottish new town originally designated for Rothes Colliery, was expressed by MR. WILLIAM HAMILTON (Lab.). The pit currently employed 849 men and 400 would be declared redundant. Most would be placed in neighbouring pits but the future of these pits—Bowhill, Kinglassie, and even Seafield—was in doubt, he said.

Replying, the UNDER-SECRETARY OF STATE FOR SCOTLAND, Mr. T. G. D. Galbraith, said he could not improve on the confidence which the Minister of Power had shown in the future of the town. The best advice he could give to Mr. Hamilton to pass on to his perhaps rather fainthearted friends were the words of the well-known hymn: "Come, labour on. Away with gloomy doubts and faithless fear."

IN A WRITTEN ANSWER to Mr. Will Owen (Lab. & Co-op.), the Parliamentary Secretary, Ministry of Power, said that the numbers of mineworkers employed in the Northumberland coalfield were 39,850 in 1945, 41,450 in 1955, and 33,500 in October, 1961. The proportionate decline between 1955 and 1961 had been about the same as for the whole of Great Britain.

OMS Rises Again in West Midlands NCB

FIRST three-figure increase in manpower recorded by the West Midlands Divisional Coal Board since August, 1957, occurred in November when the steady drain of manpower was converted into a gain of 204. There was a further rise in productivity of 0.5 cwt. to 101.7 cwt. at the face and 32.3 cwt. overall, and output, at 1,231,000 tons including production from the voluntary Saturday shift, was 74,000 tons up on November, 1960.

North Staffordshire miners reached 104.2 cwt. at the face and 30.9 cwt. overall, beating records set last June. The coal face figure in Cannock Chase rose by 5 cwt. over October's record level to 111.3 cwt., and the overall figure by nearly 2 cwt. to 35.7 cwt.

Coal's Productivity Increase Unmatched

BY the end of the year there would not be an undertaking in the country that could claim a greater increase of productivity than the mining industry, Lord Robens, chairman of the National Coal Board, said on Monday. A complete record in output per manshift had been achieved in the last five weeks, while the proportion of the output power-loaded had risen from 38 per cent. last year to 52 per cent. today. The industry had also done a magnificent job on the marketing side.

Lord Robens was speaking at the annual dinner in London of the Coal Trade Benevolent Association, over which Lord Mottistone presided. Last year the CTBA helped 430 people who had suffered hardship through sickness, disability, widowhood, and other circumstances, and in so doing had paid out £29,000, Lord Mottistone said.

NANTGARW COLLIERY NOT TO CLOSE ?

REFERRING to fears regarding the closure of Nantgarw Colliery, the Rhymney Valley (Glam), "show pit," Mr. Ness Edwards, Labour MP for Caerphilly, said at Ystrad Mynach (Mon), that his information was that the colliery was not on the list of prospective pits for closure.

Mr. Edwards commented that as far ahead as one could see, the Coal Board would have its troubles, but to preserve the industry in this country, the board must be given all possible help.

Lord Robens, chairman of the NCB, has also stated that he is "unaware of any proposal to close Nantgarw." He added that he had asked for all the big new schemes to be examined carefully, one by one, to see whether public investment was paying off.

PRODUCTION of raw steel in the United States during the week ended December 4, totalled 2,070,000 net tons, an increase of 2 per cent. over the preceding week's output, according to the American Iron and Steel Institute. Steel production in the current year, at 88,950,000 tons, is 4.6 per cent. below that of the corresponding period last year.

MAJOR RECONSTRUCTION at Cadley Hill Colliery

by J. R. GIBSON*

At Cadley Hill Colliery, the first unit to develop the western extension of the south Derbyshire coalfield, a major reconstruction involving the drivage of two surface drifts has been started. The object of this paper is to outline some of the aspects of the reconstruction. The planned phasing of the project is also discussed, and details are given of the installation of a cable-belt conveyor to deliver the output to the bottom of the drift. A further installation is planned. The paper was given to the South Midland Branch of the National Association of Colliery Managers on December 5, 1960.

EXTENSIVE workable reserves, proved by a boring programme in the late 1940s and early 1950s on the western fringe of the south Derbyshire coalfield, have added some 120,000,000 tons of coal to the potential life of the coalfield. This fringe area is known as the "western extension" (Fig. 1). Borehole logs revealed a thickening of the Red Measures in the new area and it was also apparent that the productive Coal Measures in the west lay at greater depth than previously experienced. Otherwise, the identity and character of the proved seams agreed closely with those worked in the existing coalfield.

The need to exploit this mineral wealth immediately was recognized, due regard having been paid to the diminishing of reserves within the Area, and in particular to the very short life of the collieries adjacent to the new extension. Relatively small outputs produced from difficult seams in remnant pockets of reserves could not, in the longer term, meet Area output requirements and the resultant lack of concentration of working would seriously reduce productivity and profitability.

The advantages of developing the new area from Cadley Hill Colliery were immediately recognized when the problem of working the new reserves was first considered. Concurrently with the deep boring programme mentioned above, certain underground probing had been undertaken from Cadley Hill deep-mine workings. Fig. 2 indicates the position of two twin-level winning roadways which had been driven at the lowest working horizon in the Kilburn Seam through the western boundary fault to prove the Main Coal series in the "western extension." This east-west section drawn across the existing and extension coalfields shows the horizon of the initial development headings.

Therefore in the middle 1950s it was decided that a scheme should be drawn up to exploit the workable reserves in the northern area of the "western extension." Alternative proposals were framed and

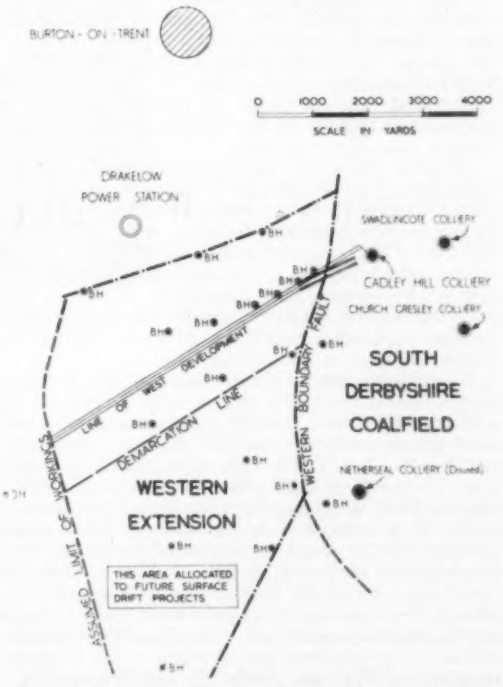

FIG. 1.—THE WESTERN EXTENSION OF THE SOUTH DERBYSHIRE COALFIELD IN RELATION TO CADLEY HILL COLLIERY.

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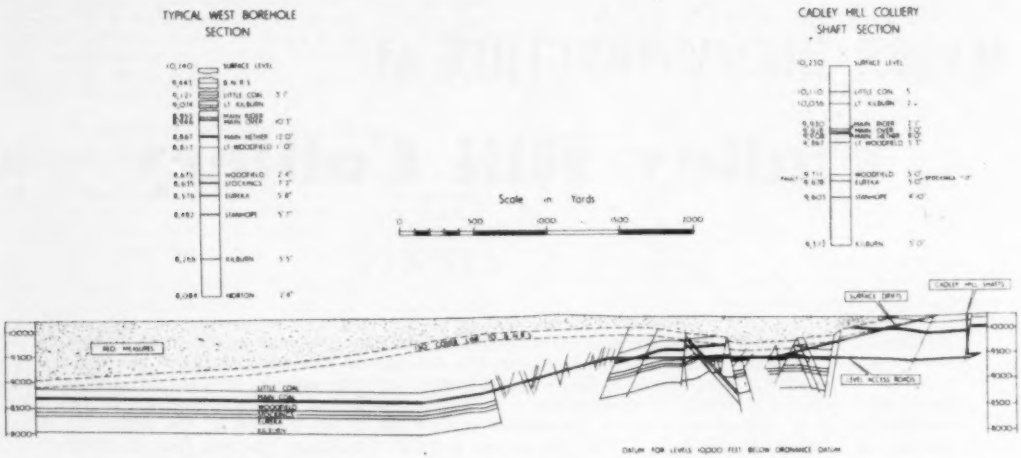


FIG. 2.—EAST/WEST SECTION ALONG THE LINE OF DEVELOPMENT FROM CADLEY HILL SHAFTS.

it was agreed that a drift mine, based on the existing Cadley Hill Colliery surface locality, would be cheaper in capital cost and more productive than the establishment of a new shaft mine or drift mine in virgin territory in the western extension itself. The scheme evolved would utilize certain existing basic services already available and most necessary for the early development of the new scheme. Furthermore, new surface drifts could be sited clear of the Red Measure strata and linked with the existing underground twin winnings, as shown in Fig. 2.

Detailed planning then proceeded, based on the allocation of 60,000,000 tons of reserves to the surface-drift project with a planned capacity of 3,000 ton/day. The previous capacity of the mine was less than 1,000 ton/day at an overall efficiency of approximately 37 cwt., and it was calculated that the new scheme would, with completion of surface reorganization and main drivages by the end of 1962 and full production by 1964, yield a productivity of nearly 50 cwt.

The agreed proposals were based on the drivage of two 14-ft. by 10-ft. surface intake drifts at a gradient of 1 in 4. The No. 1 drift would serve as a cable-belt conveyor roadway for coal transport and the No. 2 drift for high-speed manriding and materials handling. Initially new main fans would exhaust from the present upcast shafts, Nos. 2 and 3, and at a later stage in the scheme the existing downcast shaft would be converted to an upcast. In addition to the two underground drivages already mentioned, it would, in the later stages of the scheme, be necessary to drive a third main underground roadway which would be directly connected to No. 2 surface drift and continue inbve a high-speed manriding and materials handling system. The scheme also foresaw the establishment of new full and empty sidings, a new coal-preparation plant together with workshops, administrative and welfare buildings, catering for an increase in the labour force from some 500 men to a final figure of 1,300.

Careful consideration of the phasing of the necessary work in connection with the scheme laid emphasis on the following priority jobs which had to be undertaken using existing services at the colliery.

(*a*) Ventilation reorganization involving the provision of new main fans to enable the rate of underground development to be accelerated.

(*b*) West development drivages, *i.e.*, two headings proceeding due west in coal and stone, as a continuance of the headings which had already proved the western boundary fault.

(*c*) Drivage of No. 1 surface drift which would allow early installation of a cable-belt system through to the surface, giving improved clearance for stone drivages and also facilitate transport of materials during the interim construction period pending completion at a later stage of No. 2 surface drift.

The next part of this paper deals with the tasks already achieved and the work now in progress.

Reconstruction Tasks Achieved and in Progress

The civil engineering work in connection with the new fans commenced in 1959 and it was necessary to change over to the new fans in the beginning of 1960. The linking of the new fan drift into the existing fan drift presented a difficult problem, because continuity in mine ventilation had to be maintained. The condition of the existing tortuous system of fan drifts coupled with the depth and nature of the surrounding strata made it advisable to open-cut, as far as possible, the new connection from the surface rather than drive it below ground. Therefore, to maintain ventilation during the open-cut operations some type of alternative main ventilation had to be provided. The method adopted during this vital period might claim origin-

FIG. 3.—BATTERY OF FOUR AUXILIARY FANS FITTED INTO THE COMMON AIRLOCK OF NOS. 2 AND 3 SHAFTS AT CADLEY HILL COLLIERY.

ality, since it involved fitting into the common airlock of Nos. 2 and 3 shafts a battery of four 24-in. auxiliary fans, and, at the same time, sealing off the respective old fan drifts with two brick walls at the shaft sides. Fig. 3 shows the position of the auxiliary fans and the fan drift connections.

It was estimated that by adopting this method four weeks' working time was saved with very little loss in efficiency during the interim period. The new fans (shown in Fig. 4) were commissioned in April, 1960, at the initial duty of 178,000 cu. ft./min. at 5.8 in. water gauge and 82 per cent. efficiency. Each of the new fans is a 125-in. overhung single inlet backward-bladed aerofoil radial flow type with power transmission through a single reduction gearbox from a 420-b.h.p. synchronous induction motor. Each fan is fully instrumented, giving full protection on all bearings with thermocouple temperature indicators. A U-type manometer and an automatic w.g. recorder is also fitted with high and low alarm contacts. A Klaxon horn alarm system is coupled to all instrumentation.

West Development Drivages

The organization and manning of all drivages was given considerable thought by the colliery with the object of reducing team manpower and drivage costs during a period when available manpower was seriously limited. All stone drivages of 11-ft. by 9-ft. section have been driven by two men and a machine. In cases where gradients were steep and/or larger section roads were driven, three men were allowed in the team. Drivage techniques were directed at all times to efficiency and safety. Roadway and strata conditions have been variable following the initial probes through the western boundary fault at a depth of 250 yd. The Main Coal Seam inbye has been proved at 550 to 600 yd. depth and ultimate working of the lower seams will be at 750 to 1,000 yd. of cover. The working conditions have been found to be dry with emission of gas in normal quantities, and seam gradients encountered have tallied with borehole provings.

The drivages which passed through a severely faulted shatter belt have now met more settled conditions, the faulting being reduced to that experienced elsewhere in the established coalfield. The yardages completed in the years 1953 to 1957 were 4,485 for stone drivages and 1,200 for those in coal. During 1958 to 1960, 2,640 yd. of stone drivage was completed and 2,400 yd. driven in coal.

Features of this work have included:—

DRILLING TECHNIQUES.—In addition to hand-held electric drills, compressed-air drills and air legs have been utilized as well as electric drills, boom-mounted on a T2 truck. The first and second methods produced considerable benefits in hard strata, while the average drivage using the latter method and negative rake bits gave favourable results.

EXPLOSIVES.—A method study investigation revealed delays in conventional shotfiring practice. To improve operations half-second and short delay dentonators were introduced in 1955. Double

wedge patterns of drilling using this type of detonator achieved maximum pulls of 8 ft./round. Later this was adopted as standard practice in all stone drivages. In 1959 pulsed-infusion firing was introduced in Main Coal headings. This method eliminated the need for coal cutters, since their use proved difficult in prevailing seam gradients. Progress averaged 24 yd./30 manshifts per week. with an 11-ft. by 9-ft. drivage. One of the keynotes of the operation, apart from safety, has been its simplicity.

LOADING.—Initial trials with mechanical loading included duckbills, track shovel loaders, slushers, and gathering-arm loaders. Each method judged on progress justified its own application, but with the need for standardization of equipment and spares and the need for flexibility covering both normal and adverse gradients the M&C No. 3 type gathering-arm loader was selected as being most suitable to meet average conditions. Even with rather adverse gradients the improving skills of the operators substantiated the wider use of the gathering-arm loader.

From the manager's point of view, the drivage of No. 1 surface drift provided some rare experiences and the results reflected excellent team work. The length of drivage to intersect the underground lateral was 1,180 yd. at a gradient of 1 in 4. An extension beyond the intersection had to be driven to house the tension arrangement of the final conveyor system. The drift was to be supported by 14-ft. by 10-ft. arches set at 3-ft. centres with inverts in the first 375 yd. from the surface. The roadway was lined with concrete slabs and a water lodgement was provided at 350 yd. from the surface to deal with small quantities of water, pending ultimate cementation. The method of drivage was divided into four sections:—(1) Surface open-cut; (2) downward drivage on completed work; (3) pilot drivage uphill (section 11-ft. by 9-ft. arches); (4) enlargement of pilot section to completed size.

By virtue of the Coal and Other Mines (Precautions Against Inrushes) Order, 1956 (SI No. 1770), it was necessary to consider with HM Inspectorate certain geological information regarding the proximity of the Trias and the presence of old goafs, which are also indicated in Fig. 2.

It was decided that manpower should be organized into three teams consisting of three men in each, working on three shifts. Drilling equipment consisted of electric and compressed-air machines, the latter with air legs for use in hard strata. Debris was loaded out with gathering-arm loaders delivering onto 30-in. belt conveyors. The open cut was commenced in August, 1958, and allowed formation of the first 47 yd. of the dritt. The second operation of driving downwards on full section was made difficult by a heavy inflow of water of the order of 200 gal./min. which eliminated the possibility of mechanical loading. However, after reaching the 247-yd. mark mechanical loading was resumed. During this time one major collapse of the drivage occurred and the area affected was consolidated by relining with supports at 2-ft. centres and drilling and lining two 4-in. boreholes from the surface through which the cavity was filled with cement.

The third operation was the uphill drivage which commenced in November, 1958. Progress averaged 17½ yd./week and machine loading, although just possible on the adverse gradient, required a high degree of maintenance. Auxiliary ventilation was maintained by adding extra stages to the fan at the 200- and 600-yd. marks. The use of millisec. delay action shotfiring facilitated pulls of 8 ft./round. This uphill drivage thirled with the downhill roadway on January 1, 1960.

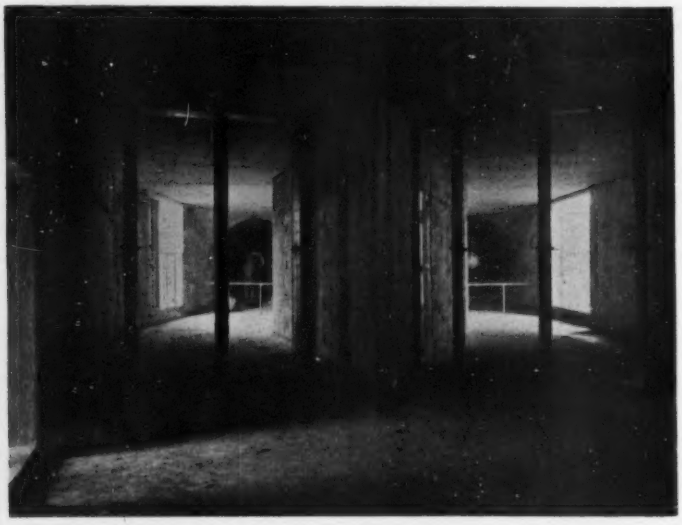


FIG. 4.—NEW FANS COMMISSIONED IN APRIL, 1960, FOR A DUTY OF 178,000 CU. FT./MIN. AT 5.8 IN. W.G.

To avoid delay in drivage, an advanced borehole sited immediately behind the drifting operation was used to locate the Main Coal goaf at a distance of 82 yd., and further holes in an umbrella fashion were bored to locate any possible hazards. No delay was experienced to the drivage operations; such exploratory work having been completed before the drift face had reached the 120-ft. protective zone.

As soon as the two headings had intersected it was possible for materials to be sent down the surface drift and this was particularly important, in that long and very heavy girders which could not have otherwise been handled down the shafts were sent down the drift for use in the construc-

tion of the cable-belt drive house, which is described later. Despite the passage of these very heavy materials, the uphill pilot head was enlarged at an average rate of 29½ yd./week, the work being completed in mid-July, 1960.

The initial intersection of the uphill and downhill drivages reflected great credit on the accuracy of the work undertaken by the surveyors, as will be seen from the following figures:—Length of main survey for closure, 4,131 yd.; length of drift drivage, 1,180 yd.; lateral error of closure, 2 in. (1 in 74,358); vertical error of closure, ½ in. (1 in 297,432); difference in bearing between the drivages, 5 sec.

Cable-belt Conveyors

The final coal transport system will consist of two cable-belt conveyors. The outbye conveyor from No. 1 surface drift bottom will deliver to the surface and the inbye conveyor will extend 2,000 yd. from the workings to the tail end of the outbye conveyor. These conveyors will have a capacity of 350 ton/hr. running at a speed of 300 ft./min. over a distance from the new coal-preparation plant on the surface to a point some 3,250 yd. underground in their initial duties, the final duty of the underground unit being a further 675 yd. extension inbye of its present position. Identical motors and drives of 500 h.p. suitable for the maximum load on a total head lift of some 2,000 ft. were planned.

Each driving unit includes a 36-in. SCR five-scoop controlled coupling, with a thruster-operated brake. Electrical motor-driven pump pressure lubricates the whole drive unit. The outbye conveyor will be installed early in 1961 and the following is a description of the work entailed in the construction and erection of the inbye installation in 1960.

Cable-belt Drive Housing

Mining operations for the cable-belt drive housing demanded the highest skill and supervision and necessitated enlargement of 60 yd. of roadway in various cross-sectional areas together with additional backripping with larger section arches at either end of the engine house area.

The supports used were specially fabricated at Area workshops. In design they consisted of vertical steel members of 10-in. by 8-in. section supporting 12-in. by 8-in. section cross members, connected by gusset brackets. Main junction points were supported by vertical members of 24-in. by 7½-in. section. Manpower for this activity was based on a three-man team on each shift. The work was carried out from either end with disposal of the debris by hand on to the trunk conveyor system and commenced in January, 1960. The accuracy of each support setting permitted little tolerance, since the interval between the sets was governed by special preformed concrete slab lining.

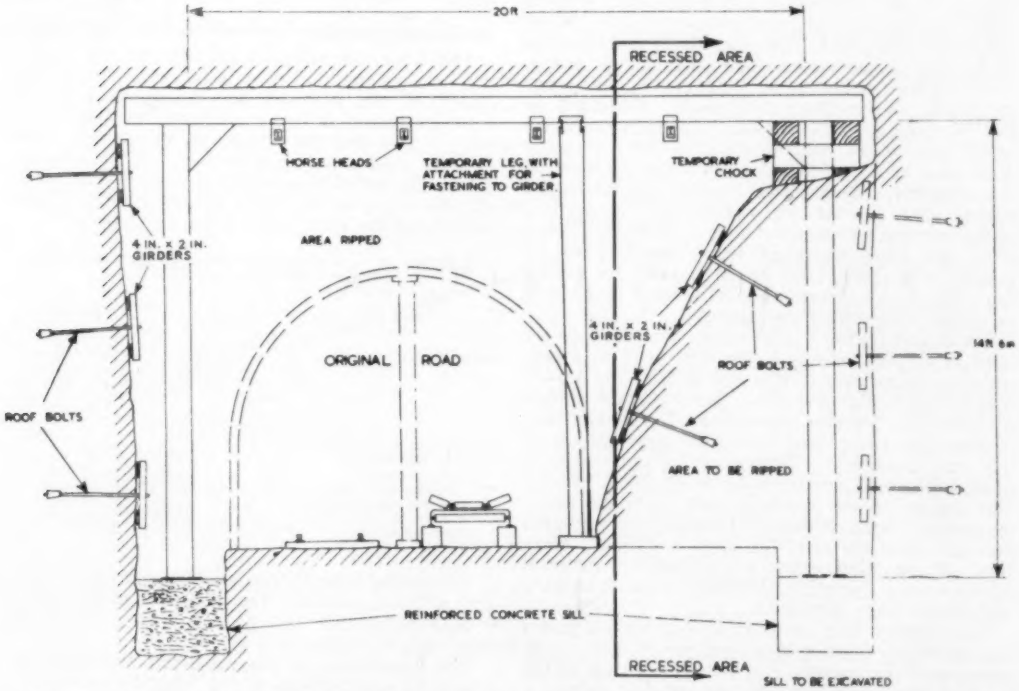


FIG. 5.—METHOD OF ERECTING WIDE "GOAL-POST" STRUCTURE FOR THE SUPPORT OF THE UNDERGROUND ENGINE HOUSE FOR THE CABLE-BELT DRIVE UNIT.

FIG. 6.—ROOF BOLTS GIVING SUPPORT TO THE SIDES OF THE CABLE-BELT DRIVE ENGINE HOUSE.

A further step taken to consolidate the main supporting pillar in this junction area, was to pack a dry aggregate of sand and gravel intimately mixed behind the brickwork. This was finally strengthened with a fine cement grout using a Mono type pump.

Excavation was carried out with minimum shotfiring, the method used being illustrated in Fig. 5. Briefly, this consisted of pilot work on either side of the existing road, in the form of a dint taken to a determined level below the floor of the roadway. Reinforced concrete placed in the dinted area formed sills on which the vertical girder members were set at a uniform level. Trimming the sides permitted these members to be placed in position, time being allowed for curing the concrete by ensuring the pilot work to be well in advance of setting operations.

To ensure safety, roof bolts were extensively used at varying heights in the new work as a precaution against falls of side and in this they proved highly successful (Fig. 6). The standard design of horsehead brackets was improved, a double supporting type being used due to the large section of the cross members. Temporary vertical members provided added support prior to the final setting. The lining of the roadway with concrete slabs, excavation work, lifting and setting of supports, etc., indicated the need for good scaffolding practice. By adapting ordinary civil building methods to this mining operation, flexibility and ease in these operations were attained.

The problem of positioning and lifting the guides was efficiently dealt with by the use of a manually operated Tirfor winch (Fig. 7). In the case of the vertical lift, necessary for the cross member, a specially designed jib bracket was clamped to the previous setting. The rope from the anchored winch was laced through pulley wheels assembled in the bracket. The end of the rope fitted with a D-link clamp was then firmly secured at the correct position of the cross member. The operation of the winch was well clear of the lifting zone and avoided possible accidents to the workmen involved.

Prior to excavation work for the drive unit basement, cross-supporting members had already been temporarily positioned. To permit final completion of the work, a temporary by-pass conveyor was installed to clear the site for erection of the unit, and still permit inbye development work to proceed unhindered. The completed basement was taken to a final depth of 5 ft. 6 in. below floor level. Levelled and positioned, the cross members were then concreted ready for the next stage in the cable belt installation. Table 1 summarizes the materials used.

Cable-belt Tension Excavations and Equipment

The work necessary to prepare for the tension end arrangements was straightforward and full details of the site and the arrangement of the rope tensioning device are shown on Fig. 8. It will be seen that the tension weight pit was offset at right angles to the conveyor line in order to permit the resumption of the forward drivage, temporarily using an orthodox conveyor loading over the top of the cable-belt tension carriages.

TABLE 1.—*Summary of Materials Used for the Completion of the Engine House for the Cable-belt Drive.*

Material.	Quantity.	Section.	Remarks.
	Ft.	In.	
Steel joist	2,000	10 by 8	Vertical support.
" "	1,200	12 by 8	Cross members.
" "	200	24 by 7½	Junction structure and bed frames.
	Total weight—90 tons		

Ancillary materials.	*Calculated excavation.*
Bricks, 100,000	Volume, 70,000 cu ft.
Concrete slabs, 5,000	Cost of enlargement, plus pit bottom transport arrangement, £35,000
Concrete (cu. yd.), 170	
Weld-mesh sheets, 550	
Roof bolts, 300	

Tensioning is power operated by a reduction gear and a 5-h.p. motor. The initial rope tension is 4 tons and initial belt tension 8 cwt., while the rope stretch allowed is 1 per cent.

The installation of the cable-belt conveyor followed the enlargement of the roadway section for the drive unit and tension-end requirements. It was also essential to redress the roadway through-

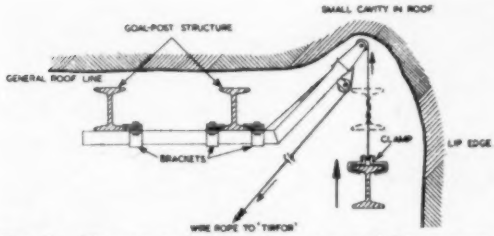


FIG. 7.—METHOD OF LIFTING "GOAL-POST" STRUCTURE BY TIRFOR WINCH.

out the existing conveyor system to levels suitable for line pulley stands, which had been laid out meanwhile in positions alongside the four conventional troughed-belt conveyors which were to be replaced.

Line stands, rigid type, pitched at 24-ft. intervals, were positioned throughout the length of the conveyor. They were fitted with top line pulleys to carry the rope, belt and load; alternate stands, carrying the bottom rope and belt, were fitted with a bottom line pulley, although this varied where gradients were adverse. The conveyor belt is of a special design, since it only forms a carrying medium for the load. It is a single ply woven fabric encased in rubber with transverse reinforcement of square section spring steel rods at 3-in. centres. The rubber covering each side of the fabric is $\frac{1}{8}$-in. thick. The V-moulded section at either edge of the belt is designed to be carried on the top and bottom ropes, the construction of which is $1\frac{1}{8}$-in. dia. rust-resisting 6 by 19 round strand Langs lay with a tensile strength of 100 to 110 ton/sq. in., and a breaking load of 63.5 tons. The total weight of the conveyor system is approximately 280 tons.

Installing the by-pass link conveyor system, in addition to drive unit erection, permitted completion of discharge head, special line stands and installation of electrical equipment included in the new conveyor system. Changing the systems commenced on July 9, 1960, with the dismantling of existing conveyors and fixing of line stands in their final position on precast concrete blocks which were previously laid out.

Lacing the Driving Ropes

The two driving ropes were delivered on a special reel which was sited at the entrance of No. 1 surface drift. Fig. 9 illustrates the method used to lace these ropes into their working position. The leading end was pulled down the drift by an automatic electro-hydraulic winch (haulage A) sited near to the drift bottom. The pull was then transferred to an identical winch (haulage B) sited at the inbye end of the system. Additional to the cable-belt rope, the winch rope of haulage A was taken inbye with this operation. At the inbye end, the duties were again reversed. By repeating the operation in the opposite direction the driving rope had completed the circuit back to the drift

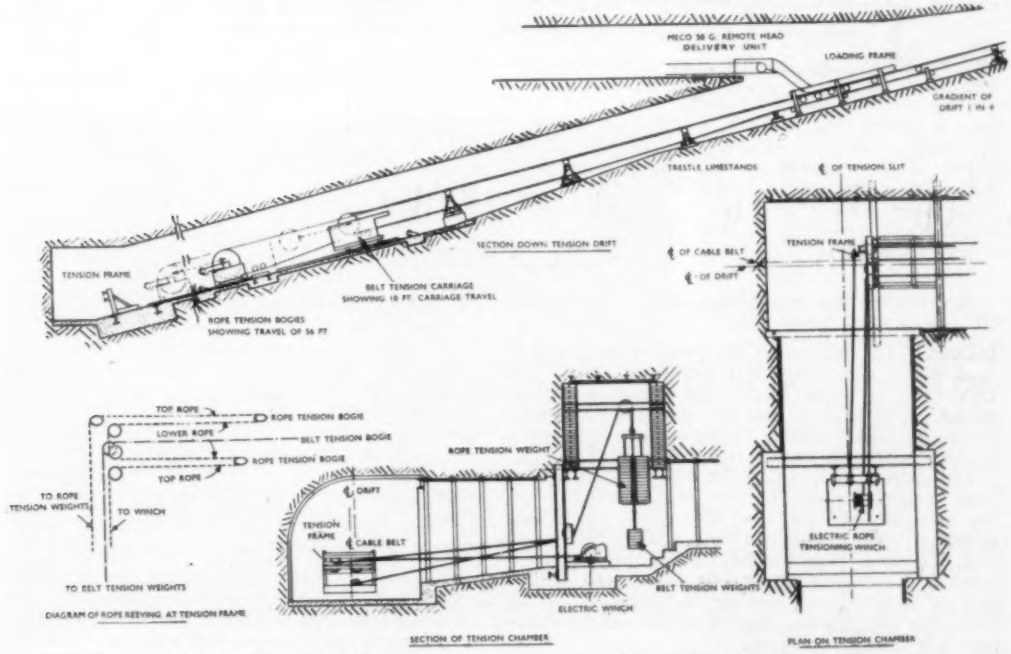


FIG. 8.—DETAILS OF UNDERGROUND CABLE-BELT TENSION-END ARRANGEMENTS.

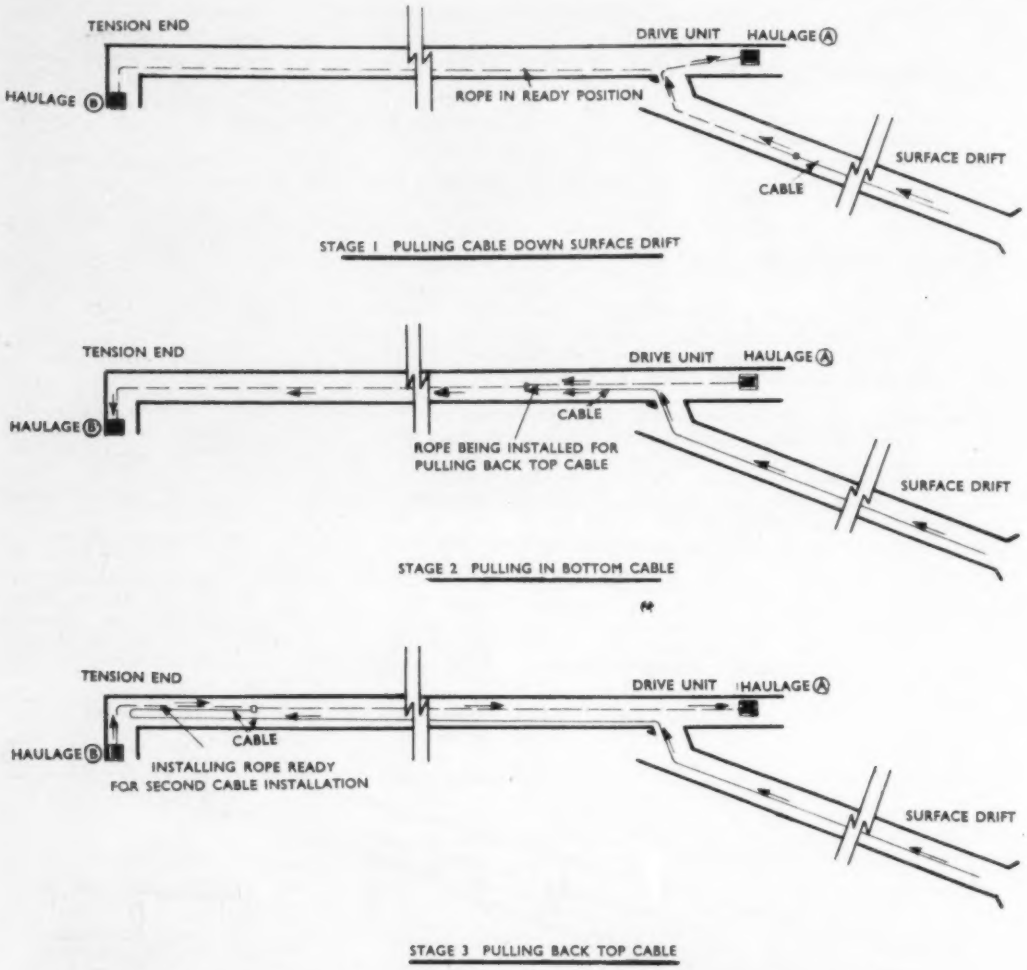


FIG. 9.—METHOD OF INSTALLING ROPES FOR THE UNDERGROUND CABLE BELT.

bottom. The operation of positioning the first rope within the system was completed when sufficient rope for surge wheels and splicing had been pulled. The second rope was put into the system using the same method. Tensioning and splicing of both ropes was completed by July 16, 1960.

The success in handling the 8,000 yd. of driving rope, weighing about 34 tons, was largely due to the assistance of the two 45-h.p. winches, each weighing 6 tons, equipped with some 6,000 ft. of ¾-in. dia. rope. The winches had a controlled rope speed of 150 ft./min. and were capable of a rope pull of some 2 tons, and set to stall at 7,000 lb. Complete and efficient control of the whole operation was thereby achieved.

The cable belt, already stored in the pit, was then ready to be installed, and this was accomplished by the use of an overhead mono-rail system (Fig. 10). Each roll of belt was carried by this means from the storage point to a special unreeling platform. The ease and efficiency of this operation enabled the installation to be successfully completed by July 20, 1960. The completed underground engine house is shown in Fig. 11.

Manriding Aspects

Efficient systems for manriding and the transport of materials are essential to economy. The present system, 3,035 yd. long, is limited to initial development requirements and consists of two installations. Each haulage engine is of 100 h.p. and

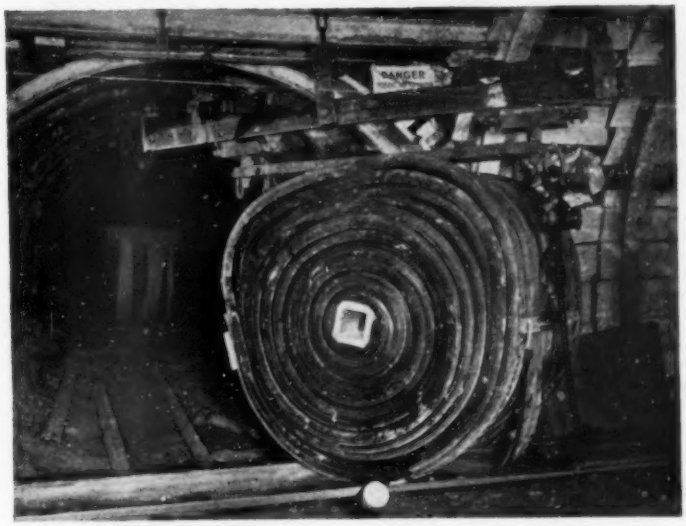


FIG. 10.—UNDERGROUND TRANSPORT OF ROLLS OF CABLE BELT BY MONORAIL.

both installations are endless-rope systems and run at 7 m.p.h.

The permanent system of manriding will consist of two reversible endless-rope installations, each one hauling two trains capable of carrying up to a maximum of 192 men per train as follows:—

(1) No. 2 surface drift 1,200 yd. at a gradient of 1 in 4 with a rope speed of 8 m.p.h.

(2) Inbye drift from surface drift bottom; 1,800 yd. initial length at 1 in 8 with a rope speed of 12 m.p.h. and capable of extension to 2,650 yd. for the final duty.

The total calculated horsepower is approximately 800 and preparation for the drivage of the above drifts is also in hand. The design of the machinery and equipment, together with the layout and construction of roadways and track, is being planned to conform to high standards and meet present-day manriding practice.

The records in capital and major revenue expenditure involved in reconstruction programmes are subject to careful scrutiny and stringent control. Documentation procedure under these conditions can only be successful when the basic system is correct. On receipt of stage 3 approvals, the responsibility for the control of expenditure passed to colliery level. The method adopted for this control consists of an examination of the breakdown of the various sections and relative jobs involved. Briefing of the authorized persons is undertaken, showing the schedule of time and materials planned for the section, with the necessary information on cast categories. Below this level, close liaison among underground officials has resulted in the provision of working plans of the district, stipulating the zones where activity is planned, also giving a clear indication of the appropriate job numbers. These plans, posted at control points, allow ease of reference. What could be a complex problem in accounting becomes instead a daily routine.

FIG. 11.—THE COMPLETED UNDERGROUND ENGINE HOUSE FOR THE CABLE-BELT DRIVE.

Summary and Conclusions

The achievements of the reconstruction to date have involved an expenditure of £1,050,000 and may be summarized as purchase of additional land, general site preparation, and installation of temporary and permanent sub-stations; installations of new fans and fan drift to Nos. 2 and 3 shafts; completion of drivages involving 7,165 yd. in stone and 3,600 yd. in coal; and installation of a 500-h.p. underground cable belt conveyor 1,850 yd. long.

Current mining works and contracts in progress are

represented by an authorized expenditure of £2,200,000 and include pithead baths, canteen, medical treatment centre, lamproom, workshops, offices, and No. 2 drift top building; new full and empty sidings together with new road bridge; No. 1 pit top building, cable belt, drive house, transfer tower, dirt bunker, etc.; coal-preparation plant of 350 ton/hr. capacity and a dense-medium washer treating +½-in. coal; inbye coal heading and cross-measure drifting.

Financial authority is, at the moment, being sought in respect of expenditure of some £800,000 for the balance of the scheme, relating to the No. 2 surface drift, Nos. 1 and 2 manriding haulages, surface locomotives, stockyard extension, and the balance of other underground equipment.

It will be seen that there is still a large measure of work to be undertaken and the object of this paper has been to show how quickly a large reconstruction can be got underway at an established colliery site where basic services are already available. The project was approved by NCB headquarters in February, 1958, and the manpower force now working on the scheme is:—NCB personnel surface and underground, 238; outside contractors building and civil work, 132, making a total of 370.

The author wishes to express thanks to Mr. W. Unsworth, No. 7 Area general manager, for permission to publish the paper. Thanks are extended to all who have assisted in compiling the paper, with special appreciation to the group project planner, and colliery staff and workmen who have contributed so much to the success of this stage of the reorganization. The contents of the paper express the author's opinion and not necessarily that of the National Coal Board.

DISCUSSION

MR. H. B. BENNETT, after congratulating the author, and commenting on the high standard of work, referred to the problem of handling development stone at collieries where the coal output was hauled entirely by conveyors. At Cadley Hill Colliery, the stone would no doubt, be stored in an inbye bunker, and dealt with on the third shift by the tandem cable belts. The main problem, said Mr. Bennett, would exist from the inbye bunker to the face, and he asked for the author's views on how he thought the problem might be tackled in an all-belt pit.

After thanking Mr. Bennett for his remarks, the AUTHOR replied that for Cadley Hill Colliery to operate efficiently as a double-shift production unit, the need to segregate production and development stone would involve the application of inbye bunkerage.

The cost of operating a duplicate belt system, he thought, would be prohibitive; again the method of small mine cars with direct haulage system was costly and ineffective particularly in long extensive haulage. He was inclined to retain the common use of the trunk conveyor system and, where economics were favourable, apply solid stowing with a control point for treatment of stone.

Replying to MR. W. LAVIN, who asked how the author proposed approaching the drivage of No. 2 drift, the AUTHOR said the experiences achieved in the driving of No. 1 drift indicated that certain changes in the methods for the driving of No. 2 drift would be made. For instance the surface section influenced by Red Measures should be pre-treated by the cementation process. On average, the drivage rate should be greater than was experienced without this precaution. The safety factor would also be ensured. The manpower and method of loading have been proved with the present system and would still be acceptable. Survey accuracy experienced in the driving of No. 1 drift established the fact that pilot work for No. 2 drift would be unnecessary.

MR. J. E. M. CHAPMAN noted the difficulty in arranging for proper timing to avoid delays when transporting men both on level and highly inclined manriding haulages which was a feature of the development to the west. He asked if any consideration had been given to using the principle of the Alpine chain lift for the highly inclined manriding haulages.

Replying, the AUTHOR said although the principle of Alpine chair lift and its efficiency was outside his experience, the questions that came to mind were its efficiency for the transportation of heavy mining equipment and difficulties concerning maintenance. The aim of management was the maximum control and efficient deployment of men. He felt the proposed manriding system adequately coped with this and he thought it was a more practical method to suit all conditions.

Temporary Ventilation Arrangements

MR. L. J. MILLS said it was interesting to note that the temporary arrangements made for ventilating Cadley Hill by fitting auxiliary fans to the airlock was so successful that the Area ventilation engineer's idea was now being applied to another colliery in the Area as an interim measure. He noted that the author said that in the western extension gas had been found in normal quantities only. He asked if there were any indications that in a virtually virgin coalfield rather more gassy conditions could be expected than was normally the case in the south Derbyshire and Leicestershire coalfields.

In reply to the point raised on gas emission from the virgin coalfield, the AUTHOR thought that the important relevant factors which formed the basis of the assumption could be enumerated as depth, seam inclination, increased ventilation pressure, and also to the fact that without the auxiliary fans continually running at weekends special precautions had been found necessary to clear headings during pre-shift examinations. These indicated a build up of methane much higher than hitherto experienced. Identical developments on similar rise gradients, but at different levels, namely, 300 yd., and 550 yd., had proved this change.

Referring to problems associated with depth, MR. J. GODLEY said the author had said the present development was to be undertaken at a depth of 250 yd. and eventually might be at 1,000 yd. He thought that the protection for roadways driven at 45-yd. centres indicated would not be adequate when the depths mentioned were reached.

In reply, the AUTHOR said it was accepted that depth was an important factor when protection of development laterals was considered, apart from ventilation leakage and its subsequent hazards. He shared Mr. Godley's view that due to depth, the development should be approached, where possible, in different horizon in the respective seams, which were in close proximity.

It would also be essential to maintain stability in the laterals and the author suggested substantial marginal pillar protection as the initial policy.

MR. S. A. MCKEE said he was interested in the use of Joy loaders on 1-in-4 gradients and noted that the

use of loaders on these gradients required good maintenance. He asked if, in addition, there were any other difficulties encountered. In reply, the AUTHOR said he thought the use of the M&C gathering-arm loader on a gradient of 1 in 4 under average conditions was the limit of the machine. Hydraulic winches incorporated to assist the machine in steeper gradients had been considered. This, however, added further potential danger and maintenance to the operations when the human element was considered. Integral parts subject to severe strain were, clutch assemblies, sprockets motivating the gathering arms and also the pivot brackets. Modifications to improve these were accepted in the early stages by the manufacturer.

One of the modifications was the shorter jib, and its advantages were proved when loading on adverse gradients onto the belt conveyor system. Track control of the machine was affected where inverts were set, the loader having to be moved back to safety, clear of the spoil due to spread from the milli-sec shotfiring. Cleanliness in loading and skill of the operator were important where soft floor conditions prevailed. Spoil allowed to collect below the apron and between the tracks retarded progress if these patches were not packed solid with wood, etc.

MR. T. C. MCCARTHY, referring to drilling in stone drifts, noted that some compressed air drilling was done, but the author appeared to prefer electric rotary drilling for most of the work. He asked if the author would enlarge upon his reasons for using compressed air drilling only where the strata was excessively hard.

The average drivage encountered was readily drilled by electric rotary machines using a negative rake bit, replied the AUTHOR. This method proved more efficient than the T2 truck with an electric mounted drill boom. Comparing the efficiency of percussive drilling using air legs, the author said percussive drilling proved satisfactory if the drivage was rising; where, however, the work was to the dip the problem was aggravated by the water used in this operation, and required further attendant labour to deal with the problem. The possibility of combining the hydraulic power pack incorporated in the loader to perform the drilling operations was one that would enhance the efficiency of drilling.

Replying to MR. J. G. ILLSLEY, the AUTHOR said method study was carried out before the department was established in the present sense. The operations in sequence were timed in every detail. What achievements were made in the initial stages were followed up when change of method was envisaged and later came to be accepted.

MR. T. W. PETERS, referring to the use in stone drivages of a Joy loader delivering to an all-belt conveyor system, asked for the author's views on bunkering behind the loader. Replying, the AUTHOR said it was most important to maintain clearance of stone from development drivages. The problem in an efficient all-belt conveyor system was when these two operations were being worked simultaneously. In such circumstances it was necessary that bunkerage should be a prime consideration. He thought that the problem at Cadley Hill could be solved by the use of mine cars and a tippler system.

MR. P. THORP said firedamp emissions from the Cadley western extension would undoubtedly be considerably in excess of those experienced in the present productive areas of the south Derbyshire coalfield. He thought that emissions of up to 200 cu. ft./ton could be expected, whereas the maximum recorded emission up to date was 90 cu. ft./ton. All future ventilation requirements had been estimated assuming these emissions and, therefore, the face ventilation air quantities would be correspondingly greater than the normal for the south Derbyshire coalfield. In addition, the coal reserves were more inclined and at a greater depth, with the result that the strata temperature would be higher and the coal would probably be subjected to more weight and crush.

Regarding spontaneous combustion, Mr. Thorp said it was well known that the Main Coal Seam was very liable to spontaneous combustion, and the problem would become even more difficult in the western extension with the greater expected firedamp emission, face air quantities, depth, strata temperature, and gradients. He asked if the author considered that it would be necessary to use solid stowing in conjunction with the working of this seam.

In reply, the AUTHOR said he did not feel it was necessary to use solid stowing in future workings in the western extension. He agreed that this practice was most successful at present installations, and certainly had eliminated the spontaneous heating hazard. However, due to the change in circumstances when depth and material handling involved in solid-stowing operations was considered, and also the ultimate envisaged daily output from the new mine, it was hardly feasible to handle the crushed debris without involving exorbitant cost in men and machinery.

HANDLING GIRDERS IN STABLES

SYSTEM for handling straight girders in stables on mechanized faces has been devised by Mr. J. Clark, a colliery manager in the National Coal Board's Scottish Division. The system makes use of self-gripping boltless clamps and mild-steel tubes.

It was developed in a colliery in which the stables on a mechanized face are supported by heavy straight girders and hydraulic props. The girders are in pairs 3 ft. apart and run at right angles to the face.

Before the stable is advanced, only one girder in each pair is erected to the roof; the other rests by its side on the rods which run parallel to the face. The rods, in turn, are supported near each end by a self-gripping boltless clamp which hangs from a girder already erected. As the stable is advanced, the "loose" girders are pulled forward on the rods and erected in their new positions.

"To draw off" the waste girder, the boltless clamps are first moved to the newly erected girders, the props are then withdrawn and the girder allowed to rest on the rods. It is then pulled forward and sits beside the others until ready for re-erection.

Advantages claimed for the system include simplification, reduced manpower needs, greater manœuvrability, and cheapness. The amount by which the girder is lowered from the roof allows it to be advanced without fouling the roof. This is often a difficulty with long bars when used with slide-bar heads.

Forthcoming Events

DECEMBER 11

Lincolnshire Iron and Steel Institute:—Meeting at the North Lindsey Technical College, Kingsway, Scunthorpe, at 7.30 p.m. "Developments at Lysaght's Rod Mill Since 1951."

Institution of Production Engineers (Leeds Section):—Meeting at the Hotel Metropole, King Street, Leeds 1, at 7 p.m. "Grinding and Precision on Machining Techniques," by H. F. Plaut.

DECEMBER 12

Institute of Marine Engineers:—Meeting at the Memorial Building, 76, Mark Lane, London, E.C.3, at 5.30 p.m. "Land Practice in Modern Steam Plant," by F. Dransfield and J. L. Gray.

Institution of Engineers and Shipbuilders in Scotland:—Meeting at 39, Elmbank Crescent, Glasgow, C.2, at 6.30 p.m. "Diesel-electric Propulsion Equipment in West Germany," by Dipl.-Ing. H. Jung and F. Fass.

Institution of Production Engineers (Doncaster Section):—Meeting at the Technical College, Waterdale, Doncaster, at 7 p.m. "Continuous Casting," by G. Littlewood.

DECEMBER 13

Combustion Engineering Association (Scotland):—Meeting at the Royal Hotel, Union Street, Dundee, at 10 a.m. Discussion on "Operational Boiler Defects and Methods of Repair" and "The Problem of Grit and Dust Emission."

North Wales Metallurgical Society:—Meeting at Flintshire Technical College, Connah's Quay, near Chester, at 7 p.m. "Radioisotopes in Metallurgy: Some Recent Techniques and their Industrial Applications," by Dr. D. H. Houseman, head of the Department of Metallurgy, Sir John Cass College, London.

Institute of Fuel (North-Western Section):—Joint meeting with the National Society for Clean Air at the Engineers' Club, Albert Square, Manchester 2, at 6.30 p.m. "Shell Boiler Developments," by G. Gunn.

Institute of Fuel (Yorkshire Section):—Meeting at the Hotel Metropole, Leeds, at 2.30 p.m. Papers by student members.

Midland Counties Institution of Engineers:—Meeting at the University of Nottingham at 3 p.m. "Experience with the Trepan Shearer in the Leicestershire and South Derbyshire Coalfield," by G. R. O. Pentith.

Royal Society of Arts:—Meeting at John Adam Street, Adelphi, London, W.C.2, at 6 p.m. "Tin: its Contribution to Social Development," by Dr. E. S. Hedges, director of the Tin Research Institute. Viscount Chandos, chairman, Associated Electrical Industries, Limited, in the chair. Tickets from the secretary.

Coal Preparation Society (North Midlands Section):—Meeting at the Department of Mining, Leeds University, at 7.30 p.m. "Education and Training in Coal Preparation," by Dr. R. L. Whitmore.

Institution of Mechanical Engineers (Yorkshire Branch):—Meeting at the College of Technology, Huddersfield, at 7 p.m. "Gear-tooth Contact Phenomena," by Dr. H. E. Merritt.

Society of Instrument Technology:—Meeting at Manson House, 26, Portland Place, London, W.1, at 7 p.m. "Application of Complex Plane Methods to System Design," by P. E. M'Pherson.

Institution of Production Engineers (Lincoln Section):—Meeting at Lincoln Technical College at 7.30 p.m. "Production Engineer, Today and Tomorrow," by F. W. Cooper.

Institution of Production Engineers (Liverpool Section):—Meeting at the Central Library, William Brown Street, Liverpool, at 7.30 p.m. "The Production Engineer's Approach to Domestic Appliance Manufacture," by V. J. Adams.

Institution of Plant Engineers (East Midlands Branch):—Meeting at the Sherwood Hotel, Theatre Square, Nottingham, at 7 p.m. "Repairs by the Metalock Process," by N. Tinwell.

DECEMBER 14

West of Scotland Iron and Steel Institute:—Meeting at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2, at 6.45 p.m. "Operating Experience with an 80-ton Electric Arc Melting Furnace," by J. M. Mowat, A. G. McMillan, and R. McDonald.

Manchester Geological and Mining Society:—Meeting at Wigan and District Mining and Technical College at 3.15 p.m. "Mine Ventilation," by P. B. Wharton.

South Wales Institute of Engineers:—Meeting at Park Place, Cardiff, at 6 p.m. "Modern Process Control," by O. G. Pamely-Evans.

Coal Preparation Society (Northern Section):—Meeting at the Lansdowne Club, Forth Lane, Newcastle-upon-Tyne 1, at 7 p.m. "Automatic Sampling," by Dr. D. A. Hall and H. Macpherson.

Institution of Mechanical Engineers (North Western Branch):—Annual dinner and visit of the president, Sir Kenneth Hague, at the Midland Hotel, Manchester.

Institution of Production Engineers (Reading Section):—Meeting at the Technical College, Boundary Road, Farnborough, at 7.30 p.m. "Practical Applications of Production Engineering Research," by Dr. D. F. Galloway.

Institution of Plant Engineers (Glasgow Branch):—Meeting at the Scottish Building Centre, 425, Sauchiehall Street, Glasgow, C.2, at 7.15 p.m. "Shipbuilding Today," by D. B. Kimber.

Institution of Plant Engineers (Merseyside and North Wales Branch):—Meeting at the Exchange Hotel, Liverpool, at 7.15 p.m. "Overhead Equipment for Railway Electrification," by J. H. Leonard.

Institution of Plant Engineers (North East Branch):—Meeting at Roadway House, Oxford Street, Newcastle-upon-Tyne 1, at 7 p.m. "Some Engineering Aspects of Recent Developments in the Iron and Steel Industry," by E. F. Wooldridge, research and development department, United Steel Companies, Limited.

DECEMBER 15

North East Coast Institution of Engineers and Shipbuilders:—Meeting at the Mining Institute, Newcastle-upon-Tyne, at 6.15 p.m. "Investigations into the Strength of Underdeck Girders Carried Out at Glengarnock," by K. V. Taylor and J. S. Shand.

Institution of Civil Engineers (Glasgow and West of Scotland Association):—Joint meeting with the Scottish Branch of the Institution of Structural Engineers at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2, at 7 p.m. "Cable Spinning on the Forth Road Bridge," by H. S. Smith.

National Association of Colliery Managers

DECEMBER 11

Midland Branch:—Meeting at Bentinck Colliery Welfare Institute, at 6.30 p.m. "Some Aspects of Powered Support Maintenance," by A. D. McLuckie, strata control engineer, East Midlands Divisional Coal Board.

DECEMBER 13

North Staffs Branch:—Meeting at the Mining Industry Offices, Leek Road, Stoke-on-Trent, at 6.30 p.m. "Stowing Dirt Transport Systems," by H. L. Rhodes.

DECEMBER 19

Yorkshire Branch:—Meeting at the Miners' Welfare Hall, Brodsworth, at 3 p.m. "Visit to Germany," by E. R. Wastell.

Research at ST. DUNSTAN'S

REFERENCE to the appointment of a director of research is made in the annual report of St. Dunstan's for the year ended March 31, 1961. The great strides in electro-mechanics made the appointment desirable. The director of research, himself a St. Dunstaner, is an associate member of the Institution of Mechanical Engineers. He keeps in touch with scientific developments at home and oversea, so far as they may bear on the technical aspects of the problems of blindness. He advises the council of St. Dunstan's on such matters and acts as executive officer of both the scientific and workshops developments committees.

The work of the organization (for men and women blinded on war service) is fully outlined in the report, copies of which may be obtained from St. Dunstan's, 1, South Audley Street, London, W.1.

CANADIAN IMPORTS of manganese ore in 1960 dropped to 56,350 tons from the 118,454 tons imported in 1959. This decline was due to an increase in the imports of ferro-manganese from 2,334 tons in 1959 to 15,495 tons in 1960, a decrease in manganese-ore stocks from 52,360 tons to 36,405 tons, and a slight decrease in steel production. No manganese ore is produced in Canada, although in past years small amounts have been mined from bog deposits in New Brunswick, Nova Scotia, and British Columbia.

The authors of this paper, W. A. Fischer and H. Straube, describe studies on an experimental converter. A new method of drawing samples suitable for oxygen determination from the converter during the blow is described. The method is used in an investigation of the oxygen curve and changes in the accompanying elements, carbon, manganese, phosphorus, sulphur, and nitrogen during the blow. The paper was translated from Stahl und Eisen, 18, 80, September, 1960 (pp. 1194-1206). The second part of the article, to be published next week, will include the complete list of references.

OXYGEN CONTENT OF BASIC CONVERTER STEEL

Changes During the Blow

THE ideas in existence today in regard to the changes in the oxygen content of the metal bath during blowing are derived from the work of F. Körber and G. Thanheiser[1], also P. Bardenheuer and G. Thanheiser[2], whose results have been confirmed qualitatively by Th. Kootz[3] and the explanation of which was attempted by W. Geller and A. Wilms[4]. H. Wentrup[5] used the dissociation phenomena in the FeO-CaO-P_2O_5 slags disclosed by W. Oelsen and H. Maetz[6] for his explanation. W. Eichholz and Th. Kootz[7] gave the presumed curve of the oxygen concentration during the blowing of a basic-Bessemer melt, mainly based on the results obtained with low-phosphorus iron open-hearth melts[8].

In recent times, no further investigations have been published on changes in the oxygen content during blowing. Due to the difficulties involved in making suitable tests, the behaviour of oxygen, which is such a very important accompaniment of iron, is still not satisfactorily explained, since although, it is true, in the first cited basic investigations, [1, 2] the method of progressive sampling was adopted, the intervals of 1 to 2 min. between the individual samplings were not sufficiently short in view of the rapid course of the reaction.

Furthermore, the nature of the sampling method provided much scope for errors, not least because, since the converter was tilted for each sampling operation, blowing was thus interrupted. Similarly, an oxygen enrichment of the blast was not taken into account. This question was not again considered until it was taken up by W. Eilender and W. Roeser[9] and in a joint Belgian work[10] and it was found that if an oxygen-enriched blast is used, no increase is to be expected in the final oxygen content of the iron in the converter. The effect on the change in the oxygen content in the metal bath during the blow is still unknown.

Thus, the necessity for again investigating the bath oxygen content in the basic converter during the blow was obvious, the more so in that a small converter which was available appeared to offer the possibility, which had hitherto been fruitlessly sought, of sampling from the converter during the blow, at very short-time intervals.

Experimental Installation

The 250-kg. (550 lb.) converter described by W. A. Fischer and M. Wahlster[11] was available for the tests. This experimental converter is a horizontal drum, lined with tar-dolomite brick, the internal cavity of which has a length of 680 mm. (27¾ in.) and a diameter of 650 mm. (26 in.). The blast is fed through 12 tuyeres, each of 8 mm. (0.3 in.) dia., representing a total blowing cross-section of 25 $cm.^2$ (3.9 sq. in.) per ton of iron. As has been demonstrated in an earlier work,[11] in this experimental converter, the refining process is conducted in the same way and at the same speed as in an industrial converter.

Two thermocouples are inserted in the tuyere ring for continuous temperature recording and are connected by balanced conductors to a multichannel, compensating recorder. The original Heratherm sheaths used for the thermocouples were replaced by specially manufactured sheaths which, with oxygen enrichment of approximately 30 per cent. by volume, lasted for three melts.

The accuracy of the measurement of the blast volumes with standard diaphragms was increased and the calculated diaphragm apertures checked by calibration tests. Fig. 1 shows the whole installation in operation: to the left of the converter

FIG. 1.—GENERAL VIEW OF EXPERIMENTAL CONVERTER IN SERVICE.

are the blast control stand and the temperature recorder.

The lining successfully withstood more than 20 melts and, under the given conditions, its durability was very good. The life of the tar-dolomite brick used for the bottom was three to four melts, in each case depending on how the melt was conducted, while hand-rammed magnesite bottoms improved the life to five or six melts.

Sampling

The essential prerequisite for the successful accomplishment of the tests was the development of a method of sampling whereby samples suitable for oxygen determination could be taken from the iron melts at very short-time intervals without requiring the interruption of the blowing process. The tilting of the converter for sampling must be avoided since the disturbance of the progress of the melt by frequent sampling is already greater than permissible. The changes in the bath composition by reactions between the melt and the slag, between stopping the blast and sampling, can likewise not be directly estimated. The requirement of a rapid sampling sequence is dictated by the very rapid changes in the oxygen concentration of the metal bath, after the transition point.

The method of taking spoon samples used in previous researches [1, 2] has so many sources of error[12] that it had to be discarded from the start. From among the known methods of sampling, only the drawing of aluminium-killed steel samples in dipped chill moulds, as first described by H. Schenck and collaborators[13] was regarded as likely to be successful. The actual tests made using dipped chill moulds did not, however, produce entirely satisfactory results since, in this experimental converter, during the period at the end of the combustion of the carbon and even during a large part of the dephosphorizing period, it was not possible to take satisfactory chill specimens from the metal bath. During this part of the blow, with the melt proceeding in the usual way, the bath temperature was so low that the cooling produced locally by the immersion of the sampling moulds prevented the melt from flowing into the moulds or produced specimens with alumina inclusions or even undissolved aluminium.

Thus, it was found necessary to develop a new method permitting the drawing of samples suitable for oxygen determination from the converter under blast. The withdrawal of the melted metal by suction into a quartz tube, a method developed by W. A. Fischer and H. vom Ende[14, 15] and frequently applied successfully in laboratory tests was taken as a basis.

The particularly difficult experimental conditions obtaining in the converter necessitated a suitable modification of this method. This consisted in that, during the insertion of the quartz tube into the melt, a powerful stream of argon is blown through the tube and, after immersion, the tube is connected to an evacuated container. Fig. 2 shows the design of the sampling arrangement.

The actual sampling tube (Fig. 2b) made from machine-drawn Rotosil was cemented in a steel tube. It contained the aluminium required to kill the steel, in the form of a piece of foil of 0.05 to 0.10 mm. thickness. This thin foil dissolved rapidly and completely during the drawing of the sample and the formation of alumina inclusions was prevented. It was shaped in such a way that it was distributed approximately symmetrically to the centre line over the internal cross-section of the Rotosil tube. The aluminium addition was 0.5 per cent. of the weight of the sample.

A rod projecting downwards through the suction aperture prevented blocking of the suction tube during immersion by contact with the converter bottom and afforded protection against mechanical damage. The sampling tube was connected to the suction pump by a flexible vacuum hose.

The suction device consisted of two vessels of different size, which could be evacuated by a rotary pump (Fig. 2a). This arrangement prevented overdrawing and made it possible, by varying the volume drawn up, to match the suction power to the viscosity of the melt, which varied considerably during the course of a blow. A capillary tube between sampling tube and suction vessel prevented the specimen being sucked up too rapidly.

For the purposes of sampling, the suction tube,

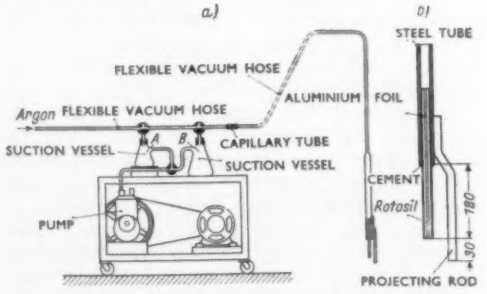


FIG. 2.—ARRANGEMENT FOR THE TAKING OF SUCTION SAMPLES FROM THE BLOWING CONVERTER.

continuously blown through with argon, was dipped into the melt. By this means, the danger of blocking of the suction aperture by thrown-up metal, lime, or slag particles was prevented. In the meantime, the suction vessels were evacuated and as soon as the suction tube dipped in the melt, it was reversed from "blowing" to "sucking" and the sample was drawn. During the sampling, the suction aperture was in the free rotating area of the converter.

The specimens were quenched in water. After a brief period of initiation, the samples could be drawn off successfully at intervals of about 20 sec. Fig. 3 shows the insertion of the sampling tube in the converter and Fig. 4 shows some of the suction samples drawn from the blowing converter.

Changes During the Blow

It was necessary to vary the diameter of the Rotosil tubes and thus of the specimens, in order to accommodate the change in the viscosity of the melt. With viscous melts, *i.e.*, generally near the transition point, Rotosil tubes with a larger internal bore were used in conjunction with larger suction volumes, whereas while the carbon content remained high and also during the latter part of the dephosphorizing period, sampling was performed with narrower tubes and smaller suction volumes.

The specimens had a completely smooth surface. Only in a very few, exceptional cases was slag also drawn up. These specimens were not used for purposes of evaluation. To exclude possible errors due to small shrinkage pipes in the core of the specimens, the core was bored out in nearly all the specimens, although in the comparative determination of the oxygen contents of a number of bored and unbored specimens, no differences were found within the usual limits of error.

According to the investigations of W. A. Fischer and H. vom Ende[14] and also those of P. Klinger[16], who reported a surface oxygen content of 0.006 per cent. for freshly made chips, no difference was to be expected to arise from the increase in the surface area as a result of the boring compared with the unbored specimens.

FIG. 3.—TAKING A SUCTION SAMPLE FROM THE BLOWING CONVERTER.

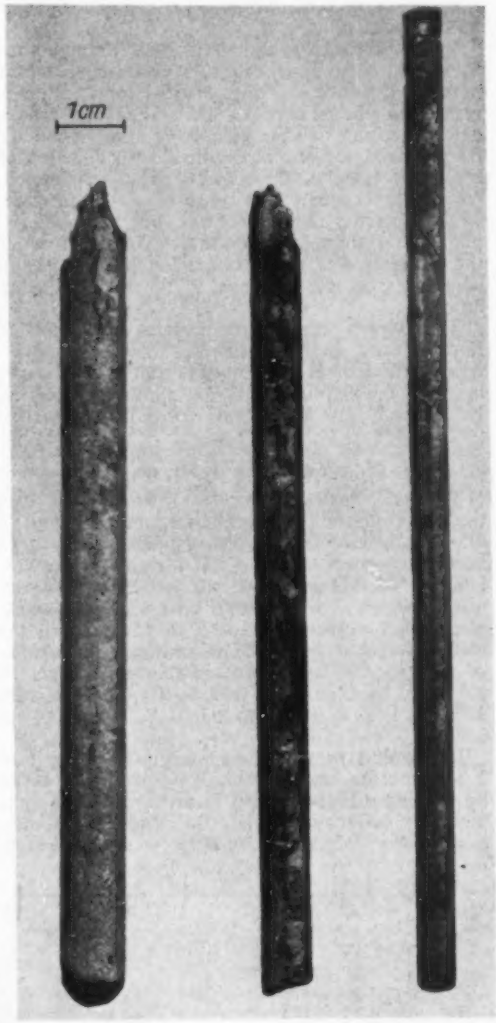


FIG. 4.—SUCTION SAMPLES TAKEN FROM THE BLOWING CONVERTER FOR DETERMINING THE OXYGEN CONTENT.

For the oxygen determination, the method of melt extraction in an argon stream, described by K. Abresch and H. Lemm[17], was used.

The yield of perfect oxygen specimens referred to the number of intended specimens was more than 88 per cent. In calculating this yield, the number of specimens not suitable for evaluation includes both those sampling attempts in which, for instance, due to the breaking off of the Rotosil tube, no sample could be drawn and also all the

tests which were inconclusive and therefore had to be disregarded.

From each suction sample, not less than two and usually three to four oxygen specimens were prepared and analyzed. Fig. 5 gives information in regard to the scatter of the individual oxygen determinations. The values of the individual oxygen analyses are represented as a function of the mean value of these individual determinations for each specimen. The range of scatter increases with increasing oxygen content, but the scatter is not greater than in other investigations in which the sampling was performed under less favourable conditions, as, for instance, in the high-frequency crucible.

The oxygen contents of a number of suction samples were also determined using the hot extraction method of H. Feichtuger[16] and a satisfactory agreement was found with the values obtained by K. Abresch and H. Lemm[17] using the carrier-gas method.

Conducting the Tests

The basic-Bessemer iron was melted down in a medium-frequency furnace and charged with a crane ladle into the converter, preheated by pressure gas burners to about 1,100 deg. C. The lime addition was 11 per cent. referred to the pig-iron charge weight. White lump lime was used exclusively with a grain size of 5 to 15 mm. In the melts evaluated here, the percentage composition of the pig-iron lay within the following limits:—3.04 to 3.64 C, 0.17 to 0.42 Si, 0.47 to 1.10 Mn, 1.58 to 1.85 P, 0.032 to 0.086 S, and 0.002 to 0.004 N.

In the first part of the blow, up to about 1 to 2 min. before the transition, samples were taken by dipping a soft-iron rod into the melt and subsequently quenching in water at intervals of 1 min. each. The subsequent samples were sucked up from the bath with the sampling arrangement described, at intervals of 20 sec. each.

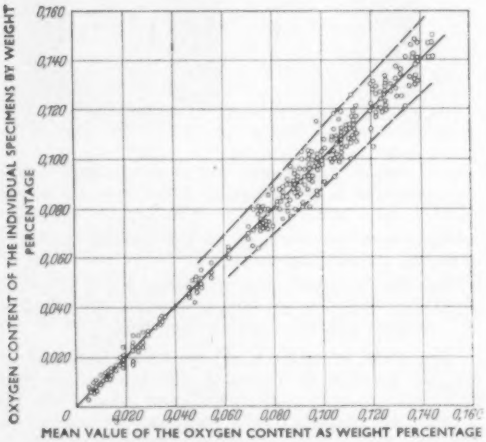


FIG. 5.—RANGE OF SCATTER IN THE OXYGEN DETERMINATIONS.

In the majority of the melts, the removal of suction samples for oxygen determination was discontinued during the first part of the decarburizing period since in this part of the blow, no important change occurs in the bath oxygen content. The exhaust gas sampling was performed at intervals of 1 min.

Particular attention was paid to regular recording of temperatures, of times of bath sampling, exhaust gas sampling, and measuring of the air blast. The difference found between the individual time measurements were always less than 2 sec. The volume of air and oxygen supplied, also the air-blast pressure, were recorded throughout the entire blow.

On completion of blowing, the melts were cast, without deslagging, into chill moulds.

Test Results

Apart from the preliminary tests to arrive at the method of sampling, for the present work, 14 blows were investigated under test conditions which were kept as uniform as possible. Depending on the temperature, the oxygen enrichment of the blast was started in each case between the first and sixth minute after the start of the blow and was kept constant between 29 and 31 per cent. by volume.

In addition to the oxygen analysis of the drawn suction specimens, the carbon, manganese, phosphorus, sulphur, and nitrogen contents of all the specimens were determined. The silicon content was determined only for the specimens of each melt taken during the first minutes of the blow.

As an example showing the course of the reaction in the experimental converter, the variations on the time scale of the experimental values obtained for two melts are plotted in Fig. 6. On the left are the values for a slow melt blown in about 16 min. and on the right those for a more rapid melt, refined in about 12 min. As the upper part of the figure shows, the air-blast feed rate fluctuates between 250 and 330 or 250 and 300 $Nm.^3/hr$. The enrichment of the blast was 30 per cent. oxygen by volume.

The values of the exhaust gas analysis plotted in the middle part of Fig. 6 follow the curve known from the industrial converter.

The sensitivity and almost immediate indication of the temperature measurement is apparent from the temperature curves in Fig. 6. At the start, the temperature rises only relatively slowly during the combustion of silicon and manganese, but with increasing oxygen content in the air blast, the curve at once becomes steeper and rises considerably more rapidly during the rapid combustion of the phosphorus.

On termination of the phosphorus elimination, it rapidly flattens and passes over into a horizontal branch which shows that, with an oxygen enrichment of the blast of 30 per cent. by volume, the

heat losses in the experimental converter used are exactly covered by the consumption of the iron.

The concept of the transition used here is the time point at which the temperature curve makes a sharp bend due to the start of the dephosphorizing process. This definition of the transition made it possible to determine exactly the time instant of the transition. This was necessary because the ordinary determination from the appearance of the fume had proved inaccurate since, particularly in the case of slowly blown melts, the characteristic change in the fume required a longer period of time.

The elimination curves for carbon, phosphorus, manganese, and sulphur, given in the lower part of Fig. 6, show the usual picture for an industrial converter. Owing to the small bath depth of only 170 mm. (7 in.), the final nitrogen concentrations remain low, at between 0.005 to 0.008 per cent. N.

The development of the oxygen curve is, however, particularly significant. It is seen that, after the transition, it rises steeply, attains a maximum approximately at the beginning of the last third of the dephosphorizing period then drops again. Only 2 min. were required to pass through this oxygen hump. To be able to determine this maximum value reliably, the rapid sampling sequence attained here for the first time, is an essential condition.

Bath Oxygen Content as a Function of the Development of the Blow

Since all the melts in which the successive removal at short-time intervals of satisfactory suction samples was possible show a basically similar change in the oxygen concentration of the bath, an attempt has been made to combine in a uniform manner the results of all the melts investigated. On account of the differences in the total blowing times, which in some cases were very considerable, a combined representation of the oxygen contents of all the melts as a function of the blowing time was not practicable. The plotting of the bath oxygen contents against the time interval from the transition, as done in Fig. 7, appeared more advantageous.

As Fig. 7 shows, if the range of scatter of the oxygen contents from about 1 min. after the transition onwards is very wide, a common evaluation of all the melts from this graph is not possible. The oxygen curves plotted for two melts with different blowing times show, in explanation of the width of the range of scatter, a distortion of the individual curves in the direction of the abscissae. For a common evaluation, a form of graph must be found compensating this distortion.

Since, above all, the volume of oxygen blown-in is determinative for the initiation of the reaction in the converter, the measured volume of blown

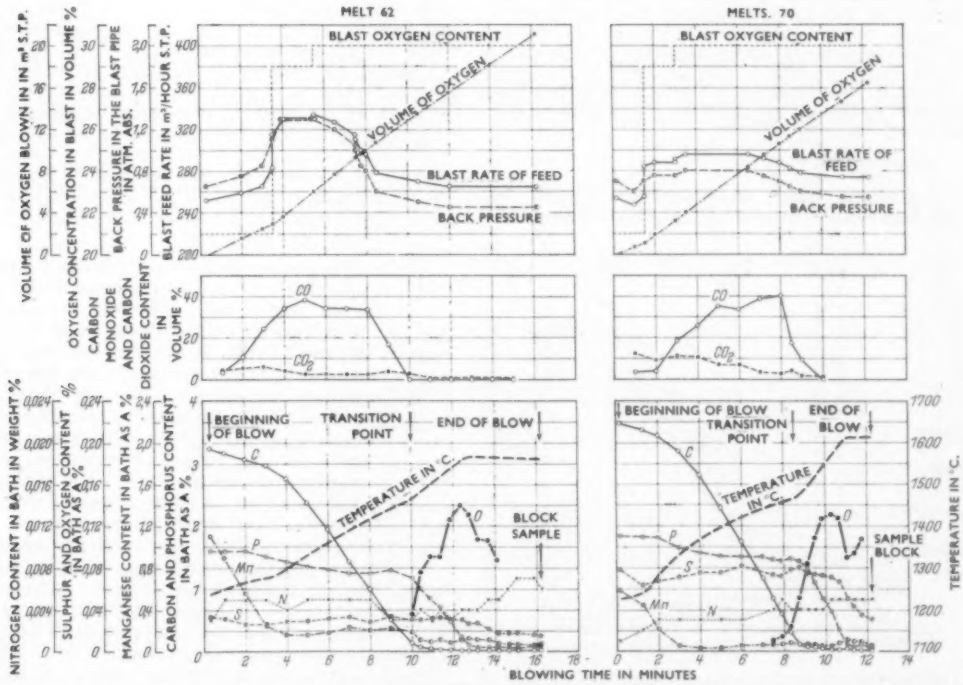

MELT 62
MELTS. 70
BLAST OXYGEN CONTENT
VOLUME OF OXYGEN
BLAST RATE OF FEED
BACK PRESSURE
CO
CO2
BEGINNING OF BLOW
TRANSITION POINT
END OF BLOW
TEMPERATURE IN °C
BLOCK SAMPLE
SAMPLE BLOCK
VOLUME OF OXYGEN BLOWN IN IN m³ S.T.P.
OXYGEN CONCENTRATION IN BLAST IN VOLUME %
BACK PRESSURE IN THE BLAST PIPE IN ATH. ABS.
BLAST FEED RATE IN m³/HOUR S.T.P.
CARBON MONOXIDE AND CARBON DIOXIDE CONTENT IN VOLUME %
NITROGEN CONTENT IN BATH IN WEIGHT %
SULPHUR AND OXYGEN CONTENT IN BATH AS A %
MANGANESE CONTENT IN BATH AS A %
CARBON AND PHOSPHORUS CONTENT IN BATH AS A %
BLOWING TIME IN MINUTES

FIG. 6.—BATH OXYGEN CONTENTS AND RELATIVE PHOSPHORUS ELIMINATION AS A FUNCTION OF THE EFFECTIVE VOLUME OF BLAST OXYGEN.

oxygen was next selected instead of the time, as the reference value. This graph differed very little from that shown in Fig. 7; there was no narrowing of the range of scatter. From the differences, in some cases large, in the measured oxygen volumes for the total duration of the individual melts blown with the same charge volumes and blowing conditions, it was to be concluded that in each case, only a certain part of the measured volume of blast oxygen was effective. To determine this effective volume of blown oxygen, the idea of the oxygen utilization coefficient was introduced, which is defined as the ratio of the volume of blown oxygen used for the consumption of the impurities in the iron to the measured volume. It was calculated as follows:

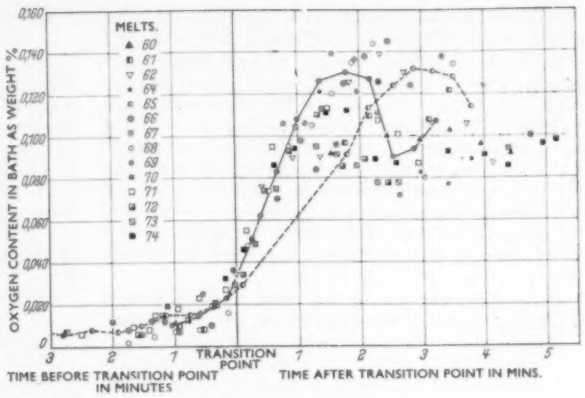


FIG. 7.—CHANGE IN TIME OF THE OXYGEN CONTENT OF THE METAL BATH IN THE BLOWING EXPERIMENTAL CONVERTER.

After the silicon and manganese removal to the slag, the blast oxygen is used mainly only for burning the carbon. The time interval T_c occupied by this exclusive carbon elimination, if the air-blast rate remains constant, can clearly be seen from the straight, sharp drop in the carbon curve. If G is the pig-iron charge weight in kg. and c the reduction in carbon by per cent. weight, during the time interval T_c, then the amount of oxygen in Nm^3, theoretically required in the same length of time is:

$$\frac{16.}{12}\cdot\frac{1}{1.429}\cdot\frac{G}{100}\cdot c = 0.933.\frac{G}{100}\cdot c$$

If O_c is the volume of blast oxygen in Nm^3, measured in the time T_c, then for the oxygen utilization coefficient, we obtain:

$$\eta_O = \frac{0.933}{100}\cdot\frac{G.c}{O_c}$$

In individual melts, a comparison could be made between the oxygen utilization coefficient calculated from this equation and that obtained from the oxygen consumption and measurement over the whole blowing period. The good agreement of the values proves the reliability of the calculation from the carbon combustion.

Assuming constant air-blast losses over the whole duration of a blow, it is possible to calculate at each instant the volume of oxygen effective up to that point as the product of the oxygen utilization coefficient by the measured blast oxygen content.

Using the transition as the zero point on the abscissae scale, in Fig. 8, the oxygen contents of the bath in the blowing converter are plotted as a function of the effective volumes of blast oxygen on the time scale. The curves of the bath oxygen contents of all the melts now lie closely together. The total range of scatter for all the melts investigated is so small that a characteristic mean curve can now be given.

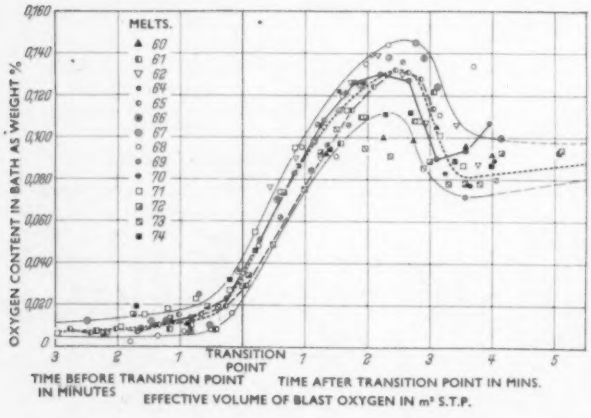


FIG. 8.—CHANGE IN THE OXYGEN CONTENT OF THE METAL BATH IN THE BLOWING EXPERIMENTAL CONVERTER AS A FUNCTION OF THE EFFECTIVE VOLUME OF BLAST OXYGEN.

The Change in the Bath Oxygen Content During the Course of the Blow

In agreement with the researches which have been published up to the present,[2, 3] Fig. 8 shows that the bath oxygen concentrations during the first part of the blow, because of the high carbon content, remains at practically unchanged low values <0.012 per cent. Only towards the end of the carbon combustion, from about 1 min. before the transition onwards does the oxygen concentration begin to increase.

Since particular importance attaches to the transition as the characteristic point of the course of the blow, it is necessary to clarify whether this time point is characterized by a well-defined oxygen concentration of the metal bath. While making the test, it was attempted, therefore, in each case, to draw a suction sample at the instant of the transition.

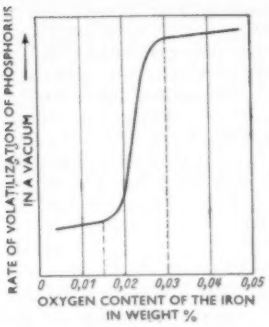


FIG. 9.—INFLUENCE OF THE OXYGEN CONTENT ON THE RATE OF VOLATILIZATION OF THE PHOSPHORUS DISSOLVED IN THE IRON IN A HIGH VACUUM (DIAGRAMMATIC).

The position of the values in Fig. 8 shows that this was successfully accomplished.

The particularly small scatter in the values at the transition further shows that a well-defined oxygen content is characteristic of this time point in the course of the blow. The oxygen concentrations found in the experimental converter lie between 0.027 and 0.038 per cent. O with a mean value of 0.034 per cent. O.

This fact is in very remarkable agreement with the behaviour of phosphorus-containing iron melts with different oxygen contents in a high vacuum. W. A. Fischer and A. Hoffmann[19] found that, in a high vacuum, the variation in the phosphorus content is determined by the oxygen dissolved in the melt. From their investigations, it is seen that, in crucibles of electrically fused magnesia and corundum, the rate of volatalization of the phosphorus in iron melts in a high vacuum increases very rapidly with bath oxygen contents between 0.015 and 0.030 per cent. O, as is shown diagrammatically in Fig. 9.

Further investigations of W. A. Fischer and A. Hoffmann[20] show very similar results for the dephosphorizing of iron melts in a high vacuum in a basic crucible (dolomite). Only above an oxygen content of about 0.25 per cent. was dephosphorization by volatilization and reaction with the crucible observed.

From this agreement, also apparent in the numerical values, between the bath oxygen content in the basic converter at the transition point and the critical oxygen concentration for the phosphorus reduction in a high vacuum, it must be concluded that the transition, *i.e.*, the rapid phosphorus combustion, can only begin if, in the melt, the activity of the phosphorus is abruptly increased by a rise in the oxygen content to an average of 0.034 per cent. O. And it is further to be concluded that this critical minimum oxygen content is the primary prerequisite for the initiation of dephosphorization.

Obviously, for the rapid breakdown of the phosphorus, the presence of a liquid slag containing lime is a further requirement, but it is not, as has hitherto been generally assumed, the presence of this slag alone which is determinative for the start of dephosphorization in the transition.

Against this new approach could be advanced the known possibility of advancing dephosphorization in the blowing process, or by other means, whereby dephosphorization is effected with high carbon contents of the bath, *i.e.*, low oxygen concentrations. In this connection it must be considered, however, that, as a result of the large amount of oxygen required for this, liquid slags with high iron content are in contact with the bath which certainly produce in the iron bath a boundary layer with a low-carbon content and a high oxygen content, and dephosphorization is thus dependent on maintaining this boundary layer.

After the transition, the subsequent course of the curve of the bath oxygen content shows a very steep rise up to a maximum with an oxygen concentration of an average of 0.132 per cent. O. Immediately after passing through this maximum, the oxygen content falls very rapidly to a mean value of 0.082 per cent. O, and finally, increases approximately linearly, but now more slowly.

If we compare this variation in the oxygen content of the bath during the course of the blow with the results of F. Körber and G. Thanheiser[1], also P. Bardenheuer and G. Thanheiser[2], then we find important differences. These works which are fundamental for present knowledge in regard to the bath oxygen contents in the basic-Bessemer process during the blow, have shown that the courses of the manganese and oxygen concentrations in the metal after the transition have a mirror-image form of relationship.

According to this, the oxygen content attains a preliminary maximum before dephosphorization, with concentrations of 0.07 to 0.09 per cent. Close upon this intermediate maximum, a drop to 0.052 to 0.070 per cent. O was observed and not until after

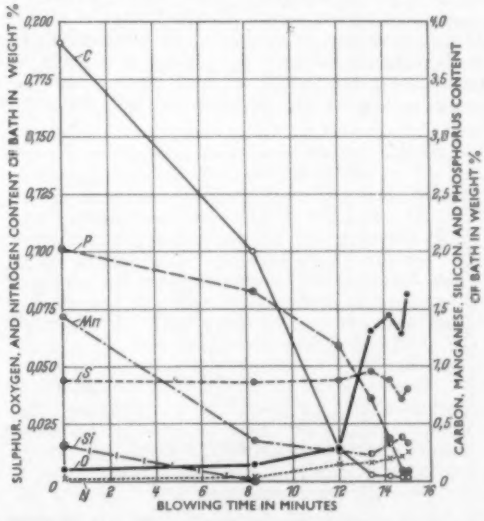


FIG. 10.—CHANGES IN COMPOSITION IN THE METAL BATH OF A BASIC-BESSEMER MELT ACCORDING TO P. BARDENHEUER AND G. THANHEISER.

the actual phosphorus period was the final increase to the final oxygen concentration of 0.08 to 0.098 per cent. O observed. The preceding decrease in the bath oxygen content which coincided on the time scale with the manganese hump was attributed to reduction due to phosphorus combustion.

Fig. 10 shows the course of a basic-Bessemer melt given by P. Bardenheur and G. Thanheiser.[2] Th. Kootz[3] obtained entirely comparable results except that the values of the oxygen content given by him are generally lower.

In the actual investigations, the highest values of the bath oxygen concentration were also found approximately at the beginning of the last third of the dephosphorizing period, but these values are far higher than those given by other research workers.

In Fig. 11 the change in the manganese concentration of all the melts with a pronounced manganese hump is compared with the variation found in the bath oxygen content during the blow. As a result of the oxygen enrichment of the blast and the low manganese content of the pig-iron, the reduction in the manganese is less than reported in earlier works.[1 to 3] No mirror-image relationship between the manganese and oxygen curves is observed. Rather, a similarity in the orientation of the curves is to be found, since, at the instant of the oxygen maximum, either the peak value of the manganese content has already been reached, or the manganese curves are already beginning to rise.

In addition to explaining the bath oxygen concentrations found in the actual experiments, an explanation is required of the differences compared with the reported results of other research workers. For this purpose, in the upper part of Fig. 12a, curve 1 of the oxygen concentrations attained in iron melts under pure FeO-MnO slags is plotted. In the lower part of the figure, the temperature and manganese curves used as a basis in plotting this curve are given, which in turn were obtained as mean values of the temperature and manganese curves of the melts given in Fig. 11 with a pronounced manganese hump.

The equilibrium-oxygen concentrations [O] $_{(FeO\text{-}MnO)}$ under pure FeO-MnO slags were calculated, assuming the validity of a distribution according to

$$[O]_{(FeO\text{-}MnO)} = \frac{(FeO)}{L}.$$

The coefficient of distribution L was calculated from the relationship established by J. Chipman and collaborators[21, 22] and confirmed by W. A. Fischer and H. vom Ende[14]:

$$\log L = \frac{6320}{T} - 2.734.$$

The molar fraction of iron (II)-oxide was determined by converting to a weight percentage the iron (II)-oxide component derived from the equilibrium constant:

$$K_{Mn} = \frac{(\%\,MnO)}{(\%\,FeO)\,[\%\,Mn]}.$$

According to the most recent investigations of W. A. Fischer and H. J. Fleischer[23] for the equilibrium constant K_{Mn}:

$$\log K_{Mn} = \frac{7110}{T} - 3.375.$$

Curve II plots the equilibrium oxygen concentration of iron under a lime-saturated, phosphate slag, according to W. A. Fischer and H. vom Ende[17] for the given temperature course and curve III plots the oxygen content under lime-saturated FeO-MnO-slags.[23] Since, according to W. A. Fischer and H. vom Ende,[14, 15] the oxygen concentrations under lime saturated slags, with or without phosphoric acid, are the same, it is to be assumed that curve III is also valid for lime saturated slags containing phosphoric acid.

The formation of the oxygen hump can be explained if we compare these equilibrium curves with curve IV giving the bath oxygen concentrations found in the present tests. The oxygen contents in the converter increase up to a maximum in the same sense as the oxygen contents under pure FeO-MnO—slags. Thus at first iron oxide slags containing manganese are determinative for the oxygen concentration in the bath and must contain, on estimate, 20 to 30 per cent. SiO_2 and CaO.

On account of this contamination, the FeO-MnO-slag for which curve I is valid is so attenuated and the appropriate equilibrium oxygen concentration so reduced that the oxygen contents found in the iron during the blowing of the converter up to the peak value in the oxygen hump can thus be identified at once. After the peak value in the oxygen hump has been passed, the relationships vary decisively.

Owing to the steep fall, curve IV is very far removed from the equilibrium values under an FeO-MnO-slag. Thus other slags become determinative for the oxygen concentration in the iron bath of the converter, slags which, as the figure

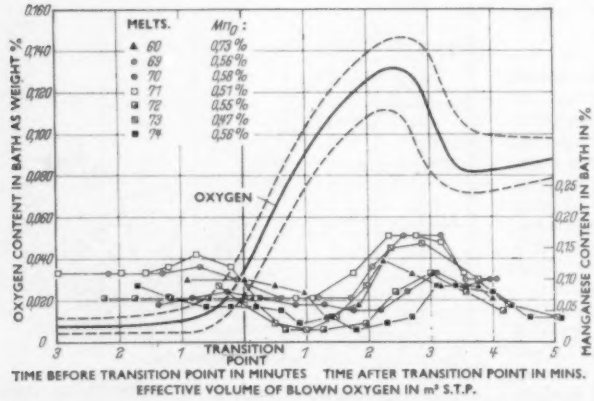

MELTS. MnO:
60 0,73 %
69 0,56 %
70 0,58 %
71 0,51 %
72 0,55 %
73 0,97 %
74 0,56 %
OXYGEN
OXYGEN CONTENT IN BATH AS WEIGHT %
MANGANESE CONTENT IN BATH IN %
TRANSITION POINT
TIME BEFORE TRANSITION POINT IN MINUTES TIME AFTER TRANSITION POINT IN MINS.
EFFECTIVE VOLUME OF BLOWN OXYGEN IN m³ S.T.P.

FIG. 11.—MANGANESE AND OXYGEN CONTENTS OF THE METAL BATH AS A FUNCTION OF THE EFFECTIVE VOLUME OF BLAST OXYGEN.

shows, largely correspond to the lime-saturated phosphate slags.

The observed hump in the oxygen curve is accordingly easily explained by the incidence of the miscibility gap, described by W. Oelsen and H. Maetz,[6] in the lime-phosphate slags containing iron. Up to the time of the oxygen maximum, the oxygen contents in the bath are determined by the high FeO-activity of FeO-MnO-slags, and this assumes the presence of a slag of this type, *i.e.*, the separation of the total slag into a ferric oxide layer low in phosphoric acid and a phosphate layer low in oxide. After the oxygen hump, the FeO activity of the non-segregated, high-lime slags, which is considerably reduced by the rapid dissolution of the lime, is determinative for the oxygen concentration of the iron.

Since the oxygen hump cannot be explained without assuming the occurrence of segregation of the slag, it can be accepted, as direct proof of this type of slag segregation during the formation of phosphate slags containing iron.

The peak values of the oxygen hump found during the present tests in the small converter agree remarkably from the numerical aspect with the saturation oxygen concentrations in the tricalcium phosphate crucible reported by G. Trömel and H. W. Fritze.[24] They found at 1,600 deg. C., concentrations of 0.13 per cent. O under corresponding phosphate slags containing lime, the composition of which was on the lime-rich side of the miscibility gap boundary.

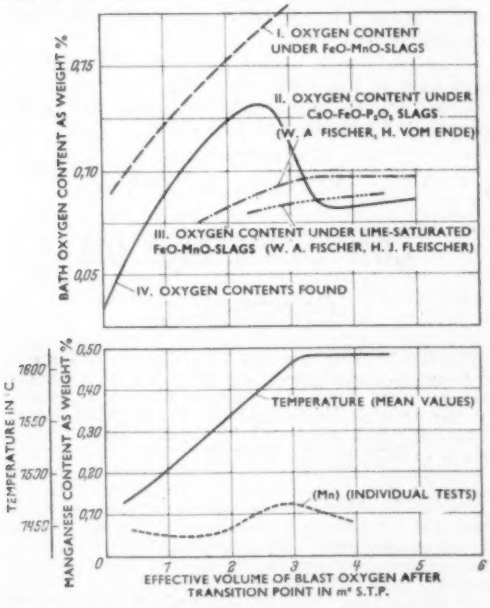

I. OXYGEN CONTENT UNDER FeO-MnO-SLAGS
II. OXYGEN CONTENT UNDER CaO-FeO-P2O5 SLAGS (W. A. FISCHER, H. VOM ENDE)
III. OXYGEN CONTENT UNDER LIME-SATURATED FeO-MnO-SLAGS (W. A. FISCHER, H. J. FLEISCHER)
IV. OXYGEN CONTENTS FOUND
BATH OXYGEN CONTENT AS WEIGHT %
0,75
0,70
0,05
TEMPERATURE (MEAN VALUES)
(Mn) (INDIVIDUAL TESTS)
TEMPERATURE IN °C
MANGANESE CONTENT AS WEIGHT %
EFFECTIVE VOLUME OF BLAST OXYGEN AFTER TRANSITION POINT IN m³ S.T.P.

FIG. 12*a*.—OXYGEN CONCENTRATIONS FOUND IN THE METAL BATH OF THE BLOWING EXPERIMENTAL CONVERTER IN COMPARISON WITH THE OXYGEN SATURATION UNDER FeO-MnO AND LIME-SATURATED SLAGS.

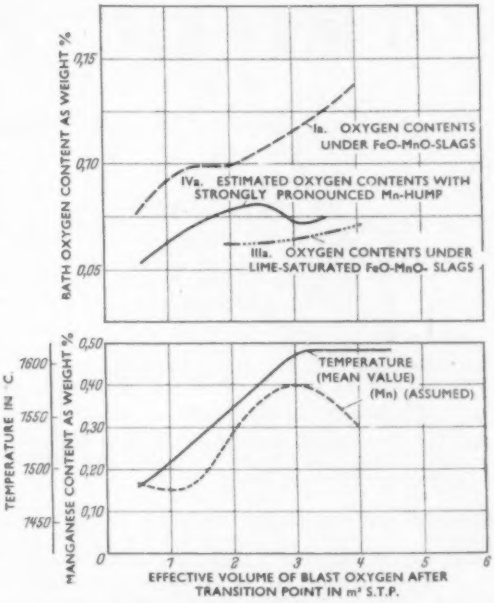

Ia. OXYGEN CONTENTS UNDER FeO-MnO-SLAGS
IVa. ESTIMATED OXYGEN CONTENTS WITH STRONGLY PRONOUNCED Mn-HUMP
IIIa. OXYGEN CONTENTS UNDER LIME-SATURATED FeO-MnO- SLAGS
BATH OXYGEN CONTENT AS WEIGHT %
0,75
0,70
0,05
TEMPERATURE (MEAN VALUE)
(Mn) (ASSUMED)
TEMPERATURE IN °C
MANGANESE CONTENT AS WEIGHT %
EFFECTIVE VOLUME OF BLAST OXYGEN AFTER TRANSITION POINT IN m³ S.T.P.

FIG. 12*b*.—ESTIMATED OXYGEN CONCENTRATIONS IN THE BLOWING BASIC-BESSEMER CONVERTER WITH A STRONGLY PRONOUNCED MANGANESE HUMP COMPARED WITH THE OXYGEN SATURATION UNDER FeO-MnO- AND LIME-SATURATED SLAGS.

In order to estimate the influence of a very pronounced reduction in manganese on the oxygen content of the bath, a " manganese peak " was plotted in Fig. 12b, approximating to the development reported by P. Bardenheuer and G. Thanheiser.[3] Assuming a temperature curve not varying from that of Fig. 12a, in the upper part of the figure, the oxygen contents corresponding to these manganese contents, of iron melts under FeO-MnO-slags (curve Ia) are given, also the oxygen contents under lime-saturated FeO-MnO-slags (curve IIIa). Curve Ia lies in the region of the oxygen hump, far below the bath oxygen contents of curve IV in Fig. 12a, found with slight reduction of the manganese. With a more strongly developed manganese hump, oxygen contents of the bath are to be expected such as represented in rough approximation by curve IVa in Fig. 12b. This curve agrees very well with the change in the oxygen content reported by P. Bardenheuer and G. Thanheiser.[3] There is also a good agreement in regard to the time scale. With full utilization of the blast, *i.e.*, with an oxygen utilization coefficient $\eta_o = 1$, with the existing test conditions, an effective blast oxygen volume of 1.5Nm³ corresponds fairly exactly to a blowing time of 1 min. The minimum value of the assumed oxygen curve with a high manganese hump must then occur precisely as the manganese hump itself, approximately 2 min. after the transition. This time interval between the manganese hump and the

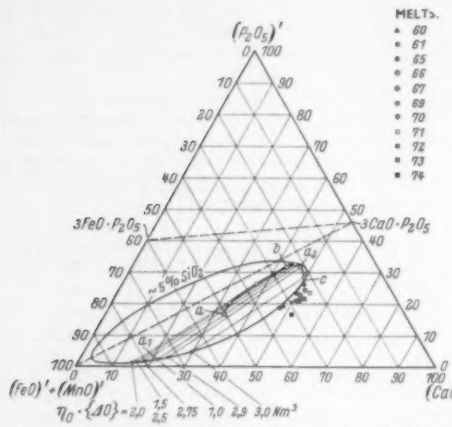


FIG. 13.—THE CALCULATED CURVE OF SLAG COMPOSITION DURING THE BLOW AND THE COMPOSITIONS FOUND IN THE FINAL SLAGS.

transition was also actually observed in the works cited.[1, 2]

The " mirror image " relationship of the development of the oxygen and manganese concentrations of the bath during the dephosphorizing period, hitherto regarded as fundamental, can no longer be justified in these generalized terms according to the present results. This is only encountered if the pronounced oxygen hump, developing with a sufficient supply of oxygen, is depressed by a heavy reduction in the manganese. Thus the oxygen content of the blast also directly influences the bath oxygen content during the blow. If it is sufficient to suppress the manganese hump, it can exceed the influence of the pig-iron manganese content, regarded as solely determinative according to the earlier investigations.[3, 4, 8]

Change in the Slag Composition During the Blow

Using simplifying assumptions, the slag compositions were calculated at different time points during the course of the blow. The result of the calculation, described in the appendix, is contained in Fig. 13.

In this figure, the boundary of the miscibility gap is plotted for a slag contamination of about 5 per cent. SiO_2 at 1,600 deg. C. The given values η_0 (ΔO) represent the effective volume of blown oxygen from the transition onwards and characterize the time point in the course of the blow for which the thinly drawn co-nodes and the overall slag compositions lying on them are valid.

The calculation begins at the time point at which, after the transition, 1Nm³ oxygen has been introduced into the melt, since, on account of the high silicic acid contents of the liquid slags, we cannot reckon on earlier demixing. The total composition of the slag then corresponds to the point *a* within the miscibility gap, *i.e.*, two slags with concentrations a_1 and a_2 are in equilibrium. With continuing blast, the total composition of the slag varies under given experimental conditions according to the thick line first, within the miscibility gap, towards the composition of tricalcium phosphate. This portion of the slag curve corresponds to the sharp rise in the bath oxygen curve. When about 2.5Nm³ oxygen have been introduced after the transition of the melt, the peak value of the oxygen concentration in the iron is attained. The slag composition at this point is characterized by the point *b*. During the further course of the blow, it then varies along the high lime-phosphate limit of the miscibility gap and emerges from here at point *c*. For this time interval of the slag curve *b*-*c*, the calculations show a far greater increase in the slag volume than is found in the preceding, longer blowing interval *a*-*b*. The observations made while performing the tests fully confirm this result. This implies, however, that the known rapid dissolution of lime occurs only during this part of the blow, *i.e.*, it starts at the instant when the oxygen maximum is reached. This fact finds expression in the deflection of the slag curve between points *b* and *c* in the direction of the lime corner. Due to the very rapid dissolution of a large amount of lime, which occurs within about 40 sec., the FeO activity of the slag greatly diminishes, also very rapidly, and the bath oxygen concentration correspondingly decreases from about 0.13 to 0.08 per cent. With further blowing, the slag composition then shifts in the direction of the (FeO + MnO) corner, with an associated increase in the iron content and increased FeO-activity, which again results in a slow increase in the oxygen content of the iron.

The analytically determined compositions of the end slags of the melts investigated, plotted in Fig. 13, are in very good agreement with this purely theoretically determined slag curve.

(To be concluded)

Conversazione on Corrosion

EXHIBITS from members will form the background of a conversazione organized by the Corrosion Group of the Society of Chemical Industry to be held at the society's headquarters at 14, Belgrave Square, London, S.W.1, on March 21, 1962. The committee wants to have exhibits illustrating current research and development and offers to provide material are now invited.

The main object of the conversazione is to stimulate informal discussion of new methods, new results, and unsolved problems. Exhibits illustrating commercial development of materials and processes are welcomed, but they must relate to new products or to fresh results and applications. The exhibition will remain open on March 22.

Offers to exhibit should be sent to Mr. E. E. White, British Iron and Steel Research Association, 140, Battersea Park Road, London, S.W.11.

SAFETY IN MINES

PRESIDENTIAL ADDRESS TO NORTHERN COLLIERY MANAGERS

WHATEVER the difficulties presented by changing conditions, and however numerous his mining and other problems might be, improved safety was ever present in the minds of colliery managers, said Mr. J. R. Robson, in his presidential address to the North of England Branch of the National Association of Colliery Managers on July 5, 1961. While it would be impossible to cover the whole subject of safety in mines in one or many addresses, underlining and emphasizing the steps to be taken to prevent accidents at the coal face, on transport roads, and those due to explosions could go a long way to effecting the maximum improvement. This goal was worthy of attainment, and he reminded the north of England managers that they were duty bound to direct their continuous effort towards improved safety.

In 1959 in the Durham Division, accidents from falls of ground were 42.9 per cent. of all killed and seriously injured, and though the fatal accident trend had been consistently downwards, the number of persons seriously injured had steadily increased.

In the middle 1920s steel straps and tubular rigid steel props had been introduced at a Durham colliery after the systematic support of longwall faces by steel props had proved successful in Scotland. In addition to being systematic, the prop density was high, straps being set at 3-ft. intervals with an additional single steel prop set between the goaf edge supports.

Pioneered in Durham

Steel arches, which were first used on the suggestion of the late Prof. Louis, were erected in both loading and tail gates, although steel arches were used by Mr. D. C. Gemmell earlier at Michael Colliery in Scotland. All this was a marked step forward. Further improvement came with the advent of the hydraulic prop, which was first tried out in the East Midlands in 1946. In recent years there followed the hydraulic chock, pioneered in Durham, which was so necessary and efficient at the goaf edge.

The importance of power loading demanded still greater attention to density of supports and to straight faces in order to prevent falls which caused accidents, loss of production, and loss of the supports themselves. Lost props should be replaced at once. This could only be accomplished, said Mr. Robson, by having an organized system of maintenance which must include spare props and bars on site. Even spare chocks were a necessity if the face was to be kept at maximum density.

Improved powered supports, and a great deal was being done to achieve this, could well be the answer to maintaining maximum support density. It might be of interest to note that in 1950 a protracted trial took place in Durham with the Bolton cutter loader. Two articles giving an account of the trial were subsequently printed in the King's College Bulletin. The inventor had the idea of getting coal without any men working at the face. From a control point at the loading gate the operator set in motion the cutting machine (which was superimposed on the conveyor) and the conveyor itself. After the machine had cut and loaded the coal for the full length of the face, the operator, by remote control, released the hydraulic props, retracted the horizontal rams which were attached to both props and conveyor, reset the props, and then rammed the conveyor forward, the cutting machine having been flitted back to the tail gate, again by remote control.

The roof and floor conditions were good, the seam only 3 ft. 3 in. thick, the coal friable and the face only 40 yd. long. Nevertheless, it was quite an achievement. Today, through the efforts of many people, much longer faces were being worked with or without powered supports and smaller teams of men, with consequent lessening of the incidence of accident.

A further attempt to mine thin-seam coal, without men working at the face, was made at Blaydon Burn Colliery in 1951 with the Haarman box. The following year, this method was employed to work successfully on several faces in a seam only 21 in. thick at a Durham colliery. Here again, the method had the effect of reducing the number of men at the face with the operator in a remote control position and was a big improvement on the skip loading which had been used previously.

In 1952, the Huwood slicer, the first activated plough, was introduced and improved at Easington Colliery, thus still further widening the field of prop-free front faces with improved roof control and hence greater safety. In 1956, flight loaders worked quite successfully on a 300-yd. double unit in a Durham colliery, and it was in this same field that double- and triple-jib cutting and loading reduced still further the number of coal shovels in use in the north of England.

A marked advance on these methods came with the resurrection of the Huwood M.L. loader. Here again, Northumberland was first in the field. Previously used in the north of England with rope haulage, this machine was vastly improved by the use of hydraulic posts and rams. It lent itself to straight line systematic supports and given reasonable roof conditions it could be operated on a 200-

yd. long single unit face. In one case, over a considerable period, it was very successful on a 280-yd. double unit face, two machines being used.

One of its great advantages was that it could be easily installed on conventional faces and used on a face newly starting from the rib side where the coal was usually harder. After the face had advanced beyond the limits of the pressure arch, the introduction of a plough could follow with better prospects of success due to increased strata pressure rendering the coal more friable. Longer faces had the supreme advantage of reducing the number of roadheads required, said Mr. Robson. Roadheads over many years had proved to be the sites of most accidents, and the north of England was early in the field of working long faces, both conventional and power loading. Accident statistics confirmed the distinct advantages to be gained from them and the o.m.s. and bulk output results spoke for themselves.

Added Difficulty

However, there was an added difficulty at power-loaded faces. This was created by the making of the necesssary stables at each end of the face. In conventional mining, when the gate rips and packs were kept up to the conveyor the distance from the packs to the face was limited. In the case of rips and packs at power-loaded faces, even when they were kept right up to the armoured conveyor, the distance from the face of the stall to the brow edge of the rip was several feet greater and comparable to that of a conventional face roadhead when the rips and packs were behind. It was essential therefore that between the ripping lip and the face, systematic and maximum density of support, including chocks, were incorporated in the Support Rules, and these should be faithfully observed if bed separation, broken roof, and cavities were to be avoided.

Not only in longwall working, but also in bord-and-pillar winnings and partial extraction power-loading, had the north of England made its early contribution. In 1946, Cumberland's Risehow Colliery was operating shortwall-cutting machines and duckbill loaders in an attempt to improve the tempo of advance, with the operators well back in a place of safety and adequately covered by supports. Later, both Northumberland and Durham were operating Universal arc-shearers, Joy loaders, and shuttle cars. In recent years the Joy continuous miner, first introduced in the Midlands, was installed in a Northumberland colliery and later at Easington in Durham. Accident rates were reduced and results were extremely good. The value of improved tempo of advance has not been assessed, but it must be great, for the winnings certainly advanced at a much greater rate than panel extraction.

More recently an interesting experiment took place in the north of England with the Durham continuous miner. This machine, designed for thin-seam extraction, was expected, ultimately, to drive some 50 yd. into a solid pillar, cutting and loading onto an extending belt conveyor; a further step forward to man-less mining at the face.

In Durham, continuous efforts were being made to reduce accidents by the safety campaign, meetings, lectures, papers, and personal attention. In the north of England mining problems were probably more difficult by reason of the fact that the field was vast, complicated, and varied. In Durham, seam thicknesses ranged from some 16 in. to 7 ft. and over, while the depths varied from those of the deeper seams under the sea to the much shallower seams in the west. Some seams in very close proximity to each other made mining and roof control even more difficult due to pillars left in old workings, and there was an additional problem due to the overlying magnesium limestone.

Present problems of roof control might be further aggravated in the future when the seams proved by the boring tower had to be worked at great distances from the shafts and again at depth. What had been done and what was being done in the field of roof control and methods of working would be of great value when the lines of communication lengthened and time available at the face was still further reduced, unless, of course, high-speed man-riding was used.

A classic example of how safe practice had more than one good effect was in the field of dust suppression. To be fully effective high-pressure pipes were laid into every district of the pit. From the shaft bottom and along the roads these were tapped to serve sprays and connections used for roadway consolidation and hydrants for firefighting, while at the face the piped water was used for wet cutting, wet drilling, power loading, and water infusion. It was also used for pulsed infusion blasting, a safe method successfully pioneered in the north of England.

The 1947 Ventilation Regulations marked another milestone in ventilation practice and standards and a still further advance was made in the north of England by the introduction of methane drainage arrangements on a retreating longwall face in 1953-54. This was subsequently adopted on advancing longwall faces and had been, for some time, customary practice in cases where longwall goaf samples showed a rising trend even on well ventilated faces.

The north of England also had the honour of being among the first in the field of man-riding locomotive haulage at Cowpen Mill Colliery in Northumberland. Durham followed with diesel locomotive man-riding haulage on adverse gradients in 1942. The bottom belt conveyor, which had made such a remarkable contribution to thin seam longwall mining, was the result of the thought and work of a Durham pioneer. "Transport Rules still further strengthen our hand," said Mr. Robson, and it was important that every endeavour should be made to see that the equipment, including safety devices, was maintained at high standards.

Duplication of Appointments

At the bigger pits the post of agent/manager was created and automatically the deputy manager followed. The Training Regulations demanded the appointment of a training officer and safety assis-

tants had been appointed. In some cases these positions were duplicated. Ventilation engineers or assistants and fire officers followed. Although somewhat delayed, engineering, mechanical and electrical staffs were being strengthened, particularly underground, and the tempo of expansion must, of necessity, keep pace with the advance towards near complete mechanization.

One of the chief difficulties was that of co-ordinating the activities of these assistants. Management derived great benefit from the visits and advice of HM Inspectors. Without necessarily giving instructions they succeeded in having attention given to points raised. It might be that a safety department with a suitably qualified head was the answer, suggested Mr. Robson. This department would benefit greatly by having an engineer safety assistant whose duties could include that of assisting to ensure the proper carrying out of the manager's planned maintenance schemes and the safe and proper use of the vast amount of machinery, mechanical and electrical.

Whatever the safety organization, it must be of high standard. Its personnel must comprise those who aspired to higher posts, yet had the necessary experience and drive towards improving safety or those, who while not seeking preferment were still just as well qualified and dedicated to the job of supplementing the efforts of the pit staff in this important work. Management could greatly influence the trend of safety, for indeed the standard of safety at any pit or group of pits was that which management accepted. It was for the members of management to emphasize and underline high standards of work and safety and see that the rules were observed; otherwise safety became secondary.

FLEXIROLL TROUGHING IDLERS FOR *Brynlliw Colliery*

FLEXIROLL troughing idler conveyors, developed by Fisher & Ludlow, Limited, Tipton (Staffs), have been installed in the course of the modernization scheme at present being carried out by No. 1 Area of the National Coal Board's South-Western Division at Brynlliw Colliery.

The colliery, closed down in 1926, was reopened in 1957 and the NCB has launched a modernization scheme for the development of reserves in the Swansea series of seams, installing new winding engines, fan and ventilation systems, underground locomotive haulage, and extensive tunnelling with the latest mechanized equipment.

Flexiroll conveyors with 30-in. wide belts have been installed in the No. 1 and No. 2 panels of the south-east section of the Six Feet Seam. Their loads are discharged on to a third Flexiroll conveyor with a 36-in. wide belt running at right angles down the main gate road to a station on the main east intake, where the coal is loaded onto the underground locomotive system. At a recent date, 1,300 yd. of 36-in. conveyor and 3,200 yd. of 30-in. conveyor had been supplied, and extensions are being made as the panels go deeper into the seam.

FLEXIROLL TROUGHING IDLER CONVEYOR INSTALLED IN NO. 1 AND NO. 2 "PANELS" OF THE SOUTH-EAST SECTION OF THE SIX FEET SEAM.

SCIENTISTS FROM the British Shipbuilding Research Association will be on Britain's newest passenger liner —the 33,000-ton-gross Transvaal Castle—when she runs trials this month. They hope to obtain information which will help to advance the design of future ships.

New Equipment and Products

Bennis Mark V Chain Grate Stoker

INTRODUCTION of the Bennis Mark V chain grate stoker is announced by Bennis Combustion, Limited, Little Hulton, Walkden, Manchester. This machine, production of which is running concurrently with the Bennis Mark IV, has been specially designed for applications where high burning rates are required.

It incorporates a new thin link giving the high air to metal ratio necessary for efficient combustion and cooling the grate under these conditions. A system of internal baffles replaces the intergrate damper, simplifying operation and regulating accurately the air supply to all sections of the grate.

Electro-hydraulic Billet Shear

BY the use of electro-hydraulic actuation, a new design of billet shear (Fig. 1) by Joseph Rhodes & Sons, Limited, Wakefield, gives 100 per cent. protection from damage by overloading, at the same time enabling any job to be tackled with complete safety to the operator. The hydraulic gear is pneumatically controlled, while a pressure-relief valve in the hydraulic circuit absolutely prevents overloading and risk of damage to the machine; in this respect the machine in safety and reliability is therefore superior to the orthodox crank-operated shear.

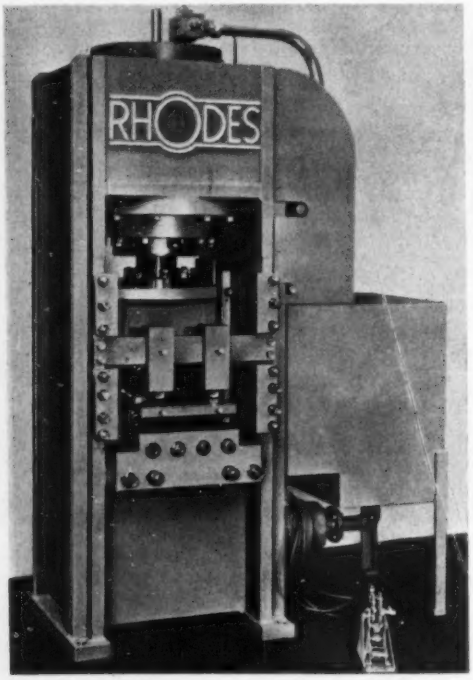


FIG. 1.—NEW DESIGN OF BILLET SHEAR INCORPORATING ELECTRO-HYDRAULIC ACTUATION.

Substitution of castings by fabricated steel gives a modern clean design and not only makes for extremely simple construction, but enables these machines to be built as required to meet customers' exact specifications. Exceptionally long slideways ensure precise alignment of the ram and prolonged blade life. Maintenance costs are therefore at a minimum.

Though primarily designed as a billet shear, the design is flexible and can easily be arranged as a robust hydraulic double-sided press at little or no extra cost. The machine illustrated has a stroke of 5 in. and will shear 12-in. by 1-in. mild or stainless steel, with a pressure of 150 tons, single or continuous stroking. The dimenions are: Height, 8 ft. 3 in.; front to back, 3 ft.; left to right, 5 ft. 6 in.; weight, 5 tons. The blades have jaw cutting edges.

Steel Net Construction by New Method

MANUFACTURED in Great Britain by Blacks Mining Equipment, Limited, 44, Masons Hill, Bromley (Kent), is a new method of making steel nets for the handling of cargo, providing protection from shotfiring, etc. Rope splicing is eliminated, the mesh being formed by patented Netlock crown units shown in Fig. 2.

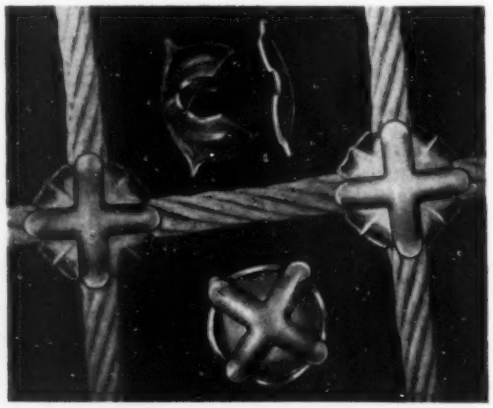


FIG. 2.—THE NETLOCK CROWN UNITS USED TO FORM THE MESH IN STEEL NETS.

With the Netlock system, the wire ropes are laid on top of each other when laying out the net and the mesh is formed with a Netlock punch, the fastening units being positioned at each cross wire junction. The fastening units are rounded to prevent snagging and wear at the joints and they also obviate the risk of frayed strands and damage to hands. Netlocks can also be used for speedy repairs to almost any type of net.

New Automatic Fuel Sack Loader

THE new Lodematic Mk. "B" automatic fuel sack loader, manufactured by Lodematic, Limited, Clitheroe (Lancs), is on large 14-in. cushioned-tyred wheels and pushes easily. Both frame and ram automatically telescope as the platform lowers, forming a compact and mobile loader. The 6-ft. "Double-Decker" is little more than 5 ft. high with platform lowered, while the 7-ft. model is 5 ft. 9 in. high, and the 8-ft. "Treble-Decker" is only 6 ft. 3 in. high. When

loaded, the platform automatically lifts, and when unloaded it descends.

The ability to halt at any intermediate height is a feature of the Lodematic. The sack can thus stop at the exact lorry deck level required for maximum efficiency and speed of off-loading—irrespective of variations in the heights of vehicles, sacks, and the operators themselves. Handling of raised sacks is similarly aided, as the sack will halt at the most comfortable and effective height to suit each individual user.

A four-stroke petrol engine with air intake dust extractor is fitted underneath a sturdy bonnet cover, shielding against weather and physical damage. Engine and hydraulic pump are direct coupled, eliminating driving belts and pulleys. A double frame of inner and outer channel sections is mounted on a sturdy chassis with short straddle arms, directly supporting the sack weight and positioning the Lodematic firmly on the ground.

Tungsten-carbide Development

PRODUCTION of a new tungsten-carbide cutting tip (Fig. 3) to machine the heat-resisting alloys used in aircraft engines, missiles, and reactor components is announced by Hoy Carbides, Limited, Saunderton, High Wycombe (Bucks). Known as CW grade, the new carbide was developed by the research staff of Hoy Carbides under the direction of Mr. E. M. Holt, chief metallurgist and technical director.

Hoy Carbides, Limited, was formed in 1958 as a subsidiary of Austin Hoy & Company, Limited, coal-cutter chain manufacturers. Since the life of a coal-cutter chain is to some extent dependent on the cutter picks and in turn on the tungsten carbide tips employed

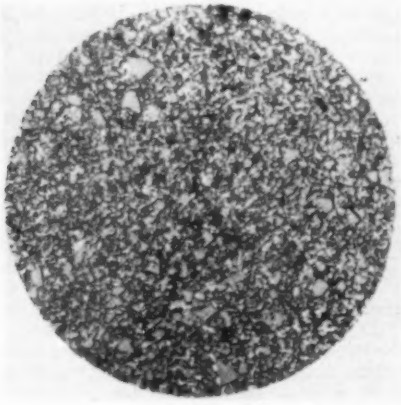


FIG. 3.—PHOTOMICROGRAPH OF STRUCTURE OF THE NEW "HOYBIDE" CW GRADE TUNGSTEN CARBIDE. SEEN HERE AT 1,500 MAGNIFICATIONS, THE MAJORITY OF THE GRAINS ARE WELL UNDER ONE MICRON.

by those picks, it was natural that the chain manufacturer should wish to control pick and tip quality. Hoy Carbides was set up to produce hard metal carbides of high purity and quality which could later be marketed in a wider industrial field.

Mobile Abrasive Wheel Metal-cutting Machine

LOCKED-COIL steel wire ropes and double wire armoured cables for electricity supply are notoriously hard to cut through with a hand hacksaw. Yet doubtless in workshops and elsewhere there still are occasions when no alternative method is available. These uses represent two only of the numerous purposes for which the efficient mobile electrically driven abrasive cutter made by Hardypick, Limited, Sheffield 8, and illustrated in Fig. 4, can be usefully employed.

The machine will cut rapidly and cleanly the following:—Lock-coil wire ropes up to and including

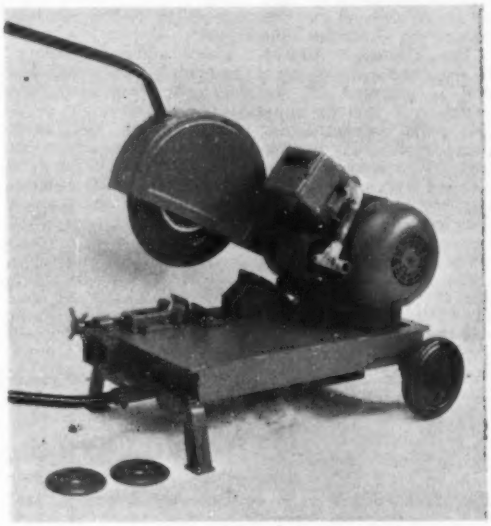


FIG. 4.—MOBILE ABRASIVE WHEEL METAL-CUTTING MACHINE.

2¼ in. dia.; mild steel up to 1¼ in. dia. or square; steel tubing 2¼ in. dia. by 3¼ in.; angle 3 in. by 3 in.; 3-core double wire armoured electric cable up to and including 3¼ in. dia.; brass or alloy rods up to and including 1¼ in. dia. or square; aluminium up to and including 2 in. dia. by slow speed.

The machine, weighing about 3 cwt., is handy and robust, with operating instructions clearly marked upon the frame. It will cut without leaving burrs, and no overheating or burning occurs at the point of severance. The appliance is safe in use, maintenance cost is low, and the abrasive wheel which will make 430 cuts through $\frac{1}{16}$-in. steel rod is then easily replaceable.

Automatic Controls

NEW version of the Leveltron industrial level controller has been produced by Thomas Industrial Automation, Limited, Altrincham (Ches). It is for use with two electrode units, one mounted at high level and one mounted at a low level position in a vessel, tank, or silo. Special contacts on the relay of the unit switch the electrodes into the circuit as required, so that, in effect, only one control unit is required for both high- and low-level control of pumps, conveyor motors, valves, etc.

The control unit has one relay only which will become de-energized when the high-level position is reached by the material, and will re-energize when the material has fallen below the low-level electrode, thus providing an automatic interlock between the two levels. The main advantage of this system is the

saving in capital outlay, since, although two electrodes are required, only one control unit is necessary.

Also launched on the industrial market by Thomas Industrial Automation is a new instrument known as the "Levelrator," which not only gives continuous indication of the contents of silos, tanks, hoppers, etc., but will also operate visual and/or audible alarms. The equipment uses one electrode only for both continuous measurement and control. Alarm points can be set to operate over the full length of the electrode to suit the particular application.

The Thomas "Add-on" alarm unit was designed to meet the demand for a complete pre-packaged unit, and is intended for flush mounting on instrument panels. It can be supplied for either single point, two point, or multipoint alarm systems, and, as its name implies, any number of these units can be added together to form a complete alarm system. They can be used with any form of instrumentation, for instance, temperature controllers, humidity controllers, pressure and level devices, etc.—in fact, any instrument which is capable of closing or opening a pair of contacts when the danger condition is reached.

The single point unit incorporates two signal lamps, one of which shows the normal condition. As soon as the danger condition is detected this normal lamp will be extinguished, and the danger lamp will be illuminated. If required, a flasher unit can be added which will operate only on the danger signal. At the same time as the danger lamp is illuminated an audible alarm would sound, and by the operation of a cancel alarm push button the audible alarm would be silenced and the visual signal would change from a flashing to a permanent illumination. The two-point alarm system contains three signal lamps.

A New Cutting Lubricant

LATEST addition to the range of cutting lubricants manufactured by Rocol, Limited, Swillington, near Leeds, is the R.T.D. spray, an aerosol form of Rocol R.T.D. compound. The compound was originally introduced for reaming, tapping, and drilling, but is now used extensively for difficult operations on all materials. The development of the R.T.D. spray enables the compound to be applied "at the touch of a button."

Introduced because of its ease and handiness, the spray has been found to have many technical advantages, especially for application in die-boxes, penetration down flutes of tools, covering of forming tools and dies, and for following moving work-pieces. It eliminates the use of a brush and pot and is of advantage in all machines not fitted with a suds pump and reservoir.

Mineworkers' Trade Unions

WORKERS in the coal-mining industry were among the first whose conditions of working led them to unite in an attempt to improve those conditions. In Part 4 of his report* for 1960, Sir Cecil Crabbe, Chief Registrar of Friendly Societies, recalls that there was extensive rioting in coal mines as far back as 1738, and pitmen on Tyneside came out on strike in August, 1765, against the refusal by colliery owners to employ a miner without a leaving certificate from his previous employers.

Sir Cecil goes on to trace briefly the history of organized labour in the industry. The first organization of colliers on a national scale was the Miners' Association of Great Britain and Ireland, which was formed at Wakefield in 1841, but collapsed soon afterwards. County organizations developed and, although membership details are obscure, it is known that the West Yorkshire Miners' Association, started in 1863, had a membership of over 10,000 by 1873. Its benefits at that time covered sickness, accident, death, and pensions to widows and orphans. The Northumberland Miners' Association grew from 4,250 in 1865 to 17,560 in 1875. There were further attempts to form national organizations and the Miners' Federation of Great Britain, which was never registered as a trade union and was the forerunner of the National Union of Mineworkers, was officially founded at Newport (Mon) in 1889, but is known to have been operating some years before that. Its membership in 1895 was 161,971 and in 1920 had reached 945,487.

Coming up to date, Sir Cecil says there are now 59 registered trade unions in the coal-mining industrial group, which can be subdivided into three sections:—Section (*a*): National Union of Mineworkers and the registered trade unions connected with it (41 unions); Section (*b*): National Association of Colliery Overmen, Deputies, and Shotfirers and the registered unions affiliated to it (12 unions); Section (*c*): Other unions (six unions).

The NUM registered on January 1, 1945, is comprised of workers employed in or connected with the coal-mining industry of Great Britain. Its principal units are styled "Areas," the majority of which are themselves registered trade unions. There are certain other registered trade unions which are associated with some of the Areas. NACODS is a newly registered federation. The 11 unions affiliated to it were already registered when the national association was registered on July 18, 1960. The association is constituted, according to its rules, by Area associations representing overmen, deputies, shotfirers, and other officials below the grade of under-manager providing they have deputy certificates. Of the six unions comprising Section (*c*) the largest is the British Association of Colliery Management with 15,657 members at the end of 1960.

The report gives details of membership and total income for the three sections as follows:—Section (*a*), 694,143 (£2,471,930); Section (*b*), 37,028 (£174,680); Section (*c*), 17,500 (£66,156), making a total of 748,671 (£2,712,766). Membership figures for sections (*a*) and (*b*) and, of course, for the grand total have been adjusted to eliminate duplication.

* "Report of the Chief Registrar of Friendly Societies for the Year 1960, Part 4, Trade Unions," Stationery Office, 2s. 6d.

CONTINUOUSLY CHARGED

Recuperative One-way Fired Steel-melting Furnace

DISADVANTAGES of the regenerative system when melting steel in the open-hearth furnace have been recognized for a number of years, and one of the recurrent suggestions for improving the efficiency of the furnace has been to convert it to one-way firing, using recuperators in place of regenerators.

A well-documented attempt at this solution was the 20-ton open-hearth furnace at Ruhrstahl A.G.,[1] which, some years before the war, was converted to one-way firing with a metallic recuperator. In this furnace, the waste gases from the furnace were reduced to a suitable temperature, before entering the recuperator, by a waste-heat boiler, as, in those days, metallic recuperators had not been developed sufficiently to withstand the high temperatures involved. While the furnace only worked a limited campaign, the point was proved that, with one-way firing, using pre-mixing burners, good efficiencies were obtained and that steel could be satisfactorily melted. This was in spite of the fact that the air preheat was only 750 deg. C. at the start of the campaign and, by the end of the campaign, had been reduced to about 500 deg. C. due to fouling of the heating surface of the recuperator.

After the war, this problem was again studied by several workers and various suggestions were made for continuously charging the stock into the furnace through shafts or sloping fore-hearths, using the counter-flow principle so that the waste gases preheated the stock before it reached the actual melting hearth.[2]

In 1957, Prof. Schack, who had been active in the experiments at Ruhrstahl before the war, in conjunction with the patentee of a steel-melting furnace incorporating the continuous charging principle[3], was putting forward the design of a two-chamber melting furnace, in the first of which

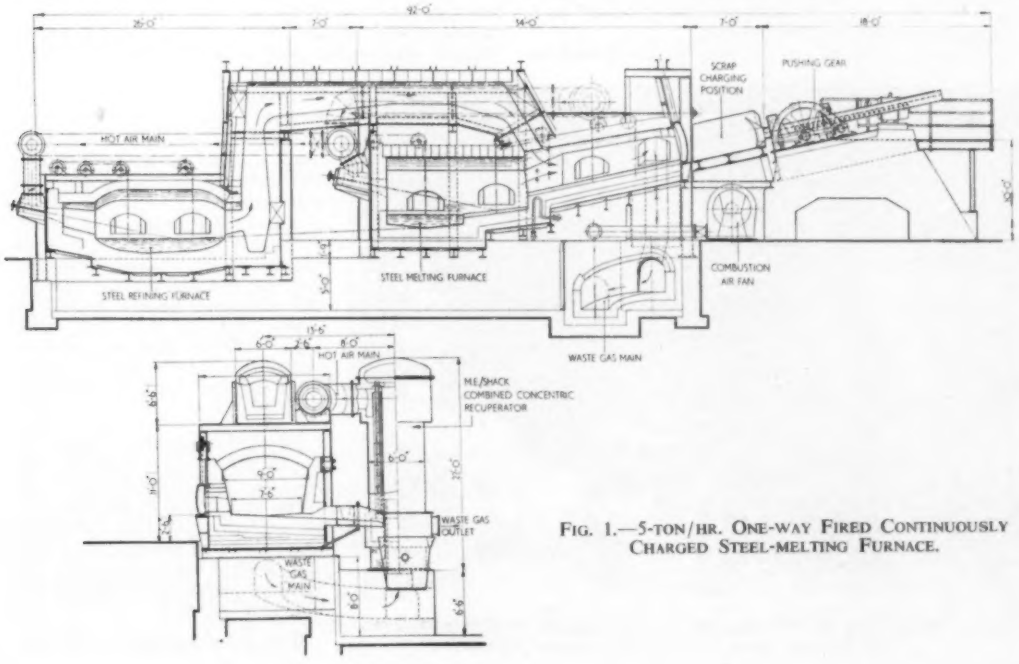


FIG. 1.—5-TON/HR. ONE-WAY FIRED CONTINUOUSLY CHARGED STEEL-MELTING FURNACE.

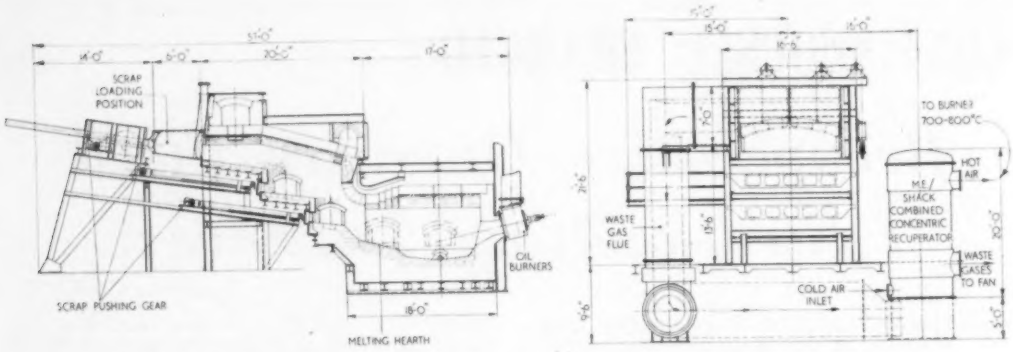


FIG. 2.—10-TON/HR. ONE-WAY FIRED CONTINUOUSLY CHARGED SCRAP-MELTING FURNACE.

the steel scrap was melted on a sloping fore-hearth by the one-way fired principle, using a pre-mix burner fed with combustion air from a newly developed high-temperature recuperator. In the second chamber, also fired on the one-way principle, the steel was finally refined, the waste gases passing to the first melting chamber (Fig. 1).

At the same time, experimental work on a small pilot continuous melting furnace, fed by gravity through a shaft, was being carried out at Sheffield University by Prof. Thring and his staff and supported by a British steel manufacturer and furnace design company. Much useful information on design principles was obtained, but the experimental scale was too small to allow a proper assessment to be made of the production potential and economic feasibility of the process.[4]

After an exchange of information, it was decided that these two forces should join in a co-operative effort to get a production-scale furnace built. In the event, it was found that a firm of tubemakers, Gebrüder Benteler at Paderborn in Germany, required to increase the production of its electric arc furnaces and, to do this, wished to have a supply of molten steel produced from steel scrap. A design for a continuously fed one-way fired recuperative melting furnace was, therefore, developed by Rekuperator K.-G., Dr.-Ing. Schack & Company, supported by model work carried out at Sheffield University, by means of which a number of design details, particularly the arrangement of pushing the scrap into the furnace, could be studied and finalized. The furnace was built and put to work in January, 1961.

The overall design of the furnace is shown in Fig. 2, and, from this, it will be seen that the furnace consists of a collecting bath which is fired by two oil burners of the pre-mixing type, with compressed-air atomization. Steel scrap is fed into the furnace down an inclined ramp which has three steps. Each of these steps has a pusher mechanism so that the steel scrap can be pushed from one step to another until it reaches the final melting hearth and so flows into the bath. A back view of the furnace showing underside of charging stage with pushers beneath is shown in Fig. 3.

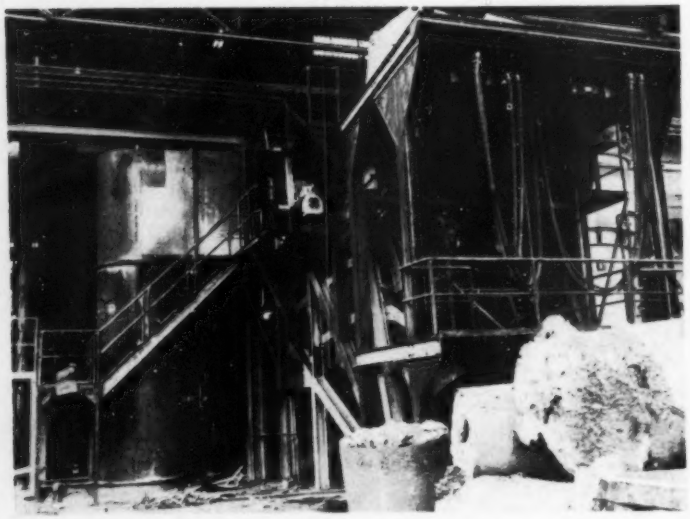


FIG. 3.—BACK VIEW OF FURNACE SHOWING UNDERSIDE OF CHARGING STAGE WITH PUSHERS BENEATH GAS OFFTAKE ON THE LEFT.

After leaving the bath, the waste gases pass through and over the steel scrap lying on the three steps, giving up heat by convection, and are exhausted through a flue system just before the sealing door between the inclined ramp and the scrap-charging position.

THE RECUPERATOR.—The flue

system leads to a Schack combined concentric air recuperator, which is capable of preheating air to 800 deg. C. with an entrance temperature of the waste gases of 1,100 deg. C. From here, the waste gases are finally exhausted by a fan through to a stack.

FURNACE RATING.—It will be noted that, in this particular design of this furnace, it is only intended to melt down scrap and make molten steel and no refining is attempted. The molten steel is tapped into ladles and fed into the electric furnace where the steel is finished to specification. The furnace was designed for an anticipated melting rate of 10 ton/hr. with a fuel consumption not exceeding 3,600,000 B.t.u./ton.

Results Obtained

Initially, the furnace was built in a very simple manner to prove whether the rated performance could be obtained. Earlier this year, a short campaign, in which some 600 tons of steel was produced, amply substantiated the claims. Very bulky steel scrap could be melted at the rate of 10 ton/hr. and the fuel consumption of approximately 2,800,000 B.t.u./ton was well below the specified figure.

After this campaign was completed, the furnace was rebuilt, incorporating water-cooling of the doors, pushers, and some other portions of the furnace. Superior refractories were installed and the pusher gear modified, and the furnace was restarted in June, 1961. It is now in regular production and the results obtained can be summarized as follow:—

OUTPUT.—8-10 ton/hr. depending on the size and condition of the scrap. Much of the charge consists of scrap from the tube mill and the balance of very dirty and poor quality scrap of all types. Bundled scrap can also be charged, but, so far, a lower rate of output has been obtained.

FUEL CONSUMPTION.—Heavy fuel oil with a sulphur content of 2.5 to 4 per cent. is used and the average consumption is 70 kilograms/ton of steel produced, equivalent to 2,780,000 B.t.u./ton.

CHARGE DETAILS.—In addition to steel scrap, about 2 cwt. of lime per 18 tons of scrap is charged and anthracite is added to recarburize. About 50 per cent. of the anthracite is recovered as carbon in the charge.

The charging hopper of the furnace is situated under the magnet crane in the scrapyard and two magnet charges are usually sufficient to build up about ½ to 1 ton in the hopper before pushing commences.

STEEL PRODUCED.—The carbon required is 0.3 to 0.4 per cent. and this can easily be obtained by charging suitable quantities of anthracite. Carbons as low as 0.1 per cent. or as high as 1.17 per cent. have been produced without difficulty. The manganese content is normally 0.15 per cent. and the sulphur is 0.1 per cent., although this is regarded as high and work is being done to reduce this.

The normal tapping temperature is between 1,500 to 1,600 deg. C. and the yield about 91 per cent., which, in view of the dirty condition of the scrap, is thought to be satisfactory.

TEMPERATURES IN THE SYSTEM.—The average temperature of the waste gases entering the recuperator is 950 deg. C., the air preheat 670 deg. C. and the final waste-gas temperature 450 deg. C. The average air volume blown is 175,000 cu. ft./hr.

The recuperator is equipped with shot cleaning for the tubular section, operating for 5 to 8 min. in every hour, and this has been proved very successful in practice. After the first campaign, the recuperator tubes were examined and found to be perfectly clean.

Conclusions

While this furnace cannot be regarded as finally developed, as considerable work, particularly on the pusher gear, has yet to be done so as to obtain a higher rate of charging, it is in regular production producing molten steel at a reasonable fuel consumption.

REFERENCES

[1] E. Hofman and M. Paschke. Stahl und Eisen, 1939, vol. 59, pp. 117-126.
[2] M. W. Thring. J. Iron and Steel Inst., 1954, pp. 424-432.
[3] A. Schluter. German Patent No. 880,636 filed July 22, 1951.
[4] J. W. Eyre, C. Hulse, and M. W. Thring. "Steel Melting in a Pilot Plant Shaft Furnace," Symposium on Pilot Plants in Metallurgical Research and Development, organized by the National Metallurgical Laboratory, Jamshedpur, India, February 15, 1960, p. 119 (reproduced in last week's issue of IRON AND COAL, p. 1159.)

VACATION COURSE on *Cathodic Protection*

INTENDED for workers in the field of corrosion who are particularly interested in the problems associated with cathodic protection in practice, a vacation course on cathodic protection—instrumentation, interference, and interference testing, is to be held at Battersea College of Technology on December 19 and 20. It is being organized by the metallurgy department with the co-operation of the Corrosion Group of the Society of Chemical Industry.

As the course will emphasize the instruments and their mode of application, particularly in interference testing, it will be assumed that members of the course will be familiar with the principles and practice of cathodic protection. Time will be given during each afternoon for a full discussion of the day's proceedings.

Enrolment forms may be obtained from the Secretary (Metallurgy Courses), Battersea College of Technology, London, S.W.11. The fee of £6 includes luncheon and other refreshment.

ACCORDING TO the Cámara Nacional de la Industria del Hierro y del Acero, by 1965 Mexico's steel production will be of the order of 3,875,000 tons of bars, which will permit the exportation of some 773,000 tons to the countries of the ALALC. This item may well be the most important of all those which Mexico hopes to export to the South American countries.

New Patents

PATENTS below are among the complete specifications accepted listed in the Official Journal (Patents). The numbers given are those under which the specifications have been printed and all subsequent proceedings will be taken.

Applications for copies of the full specifications (3s. 6d. each, post free) should be made to the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C.2.

Mining and Mining Appliances

874,107 CLIMAX ROCK DRILL & ENGINEERING, LIMITED. Rock drills.

874,842 HUGH WOOD & COMPANY, LIMITED. Metal pitprops.

874,483 GEWERKSCHAFT EISENHUTTE WESTFALIA. Tooth-wheel coupling for mining machine drives.

874,435 A. HAARMANN. Advancing mine roof support structure.

874,733 MATTHIAS SPENCER & SONS, LIMITED. Coal-cutting chains.

874,806 STAMICARBON, NV. Mine shaft winding systems.

874,957 ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED. Winders and hoists.

874,892 MOUILLERES DU BASSIN DU NORD ET DU PAS-DE-CALAIS. Explosion proof enclosures for electric mine equipment.

874,999 BWG BERGWERK-UND WALZWERK-MASCHINENBAU, GmbH. Hydraulic telescopic pitprops.

875,303 MAATSCHAPPI TOT EXPLOITATIE VAN HYDRAULISCEE MIJNAPPARATUUR, NV. Hydraulic pitprop.

875,426 LICENCIA TALALMANYOKAT ERTEKESITS VALLALAT. Hydraulic conveying apparatus for mines.

875,804 GUTEHOFFNUNGSHUTTE STERKRADE, AG. Linings for mine shafts.

876,114 BECORIT GRUBENAUSHAU GmbH. Hydraulic pitprop.

876,396 GUTEHOFFNUNGSHUTTE STERKRADE, AG. Hydraulic pitprops.

876,146 GUTEHOFFNUNGSHUTTE STERKRADE AG. Operating vertically slidable gates of skips in guided skip hoists.

876,369 GUTEHOFFNUNGSHUTTE STERKRADE AG. Cage or skip guides for shafts.

876,148 GEWERKSCHAFT REUSS. Chute for mine waste or other materials.

876,236 GEBR. EICKHOFF, MASCHINENFABRIK UND EISENGIESSEREI. Control apparatus for fluid-pressure operated motors of mining machines.

876,312 DOWTY MINING EQUIPMENT, LIMITED. Scraper ring arrangement for fluid-pressure operated jacks and props.

Metallurgy and Engineering

874,300 SHEPPARD & SONS, LIMITED. Apparatus for cutting the surface of bars, billets, etc.

874,366 BRITISH IRON AND STEEL RESEARCH ASSOCIATION. Treatment of steel surfaces.

874,379 ACIERIES REUNIES DE BURBACH-EICH-DUDELANGE, SA (ARBED). Manufacture of steel.

874,181 MANNESMANN, AG. Adding deoxidizing and alloying elements to molten metal baths.

874,393 VEREINIGTE OSTERREICHISCHE EISEN- UND STAHLWERKE, AG. Process for the production of high-grade cast iron.

874,488 H. G. BOULY (American Steel Foundries). Steel alloys.

874,909 BRITISH IRON AND STEEL RESEARCH ASSOCIATION. Manipulators.

875,232 WILD-BARFIELD ELECTRIC FURNACES, LIMITED. Electron beam furnace for the production of gas-free metals.

875,178 VESUVIUS CRUCIBLE COMPANY. Stopper for a molten-steel ladle.

874,989 UNITED STATES STEEL CORPORATION. Briquetting roll.

875,344 AMERICAN CHAIN & CABLE COMPANY, INC. High-strength aluminium-coated steel.

875,737 BTR INDUSTRIES, LIMITED, and B. G. BIRKIN. Rollers for pickling baths.

875,769 KLOCKNER-HUTTENWERK HASPE AG. Steel.

875,733 VEITSCHER MAGNESITWERKE AG. Suspended furnace roofs.

875,913 INTERNATIONAL NICKEL COMPANY (MOND), LIMITED. Alloy steels.

876,404 DIAMOND ALKALI COMPANY. Treating molten metal.

876,397 STAVELEY IRON & CHEMICAL COMPANY, LIMITED, and others. High-phosphorus cast iron.

876,032 BRITISH NON-FERROUS METALS RESEARCH ASSOCIATION. Galvanizing of steel.

876,431 HAGAN CHEMICALS & CONTROLS, INC. Controlling the flow of hot blast to blast-furnace tuyeres.

876,437 UNITED STEEL COMPANIES, LIMITED. Chromium-nickel-manganese steel.

876,458 FORD MOTOR COMPANY, LIMITED. Austenitic alloy.

Fuel Treatment and Utilization

874,302 CHARBONNAGES DE FRANCE. Carbonization of coal by the fluidization technique with production of low-temperature coal tar.

874,686 AMERICAN CYANAMID COMPANY. Protecting coal against deterioration.

875,534 BERGWERHAVERBAND, GmbH. Treatment of coal-distillation gases.

Data Sheets on High Purity Metals

LATEST series of data sheets issued by Johnson, Matthey & Company, Limited, 73-83, Hatton Garden, London, E.C.1, covers its range of high purity metals. In recent years, the rapid advance of technical developments in many fields has brought about a demand for a wider variety of high purity metals and a greater diversity of physical forms. The company has investigated and perfected techniques for producing an extensive range of high purity metals and for fabricating many of them into rod, sheet, and other forms.

In the data sheets, information is given on 38 metals, including noble, rare earth, and certain base and rarer metals. The general properties of each element are tabulated and details are given of the forms of current production. In most cases the metals are available in more than one grade, the metallic impurity contents being expressed in parts per million. The sheets are available on request.

THE BRAZILIAN Federal Government is to subscribe for stock in Acos Finos Piratini, which is being formed by the Rio Grande do Sul State Government for the production of fine steels.

NEW LITERATURE

COPIES of the catalogues, brochures, house magazines, and other publications referred to below are usually available to our readers on request. Application should be made to the address given, mention being made at the same time of this journal.

TARMAC, LIMITED, Ettingshall, Wolverhampton—A description of the new automatic coated macadam plant at Shap (Westmorland) has been published in booklet form. The whole programme was carried through under the direction of the development department of Tarmac Roadstone, Limited, in conjunction with Harrison's Limeworks, Limited.

THOS. W. WARD, LIMITED, Albion Works, Sheffield—A new booklet is now available on the Douglas Automaster 22-ton dump truck, which is made by F. L. Douglas (Equipment) Limited, Cheltenham, Thos. W. Ward being the sole UK distributors. Simplicity of operation is a feature of this robust power unit, which is fully described and illustrated.

STEEL, PEECH & TOZER (branch of the United Steel Companies, Limited, The Ickles, Rotherham)—News of the company's activities and the employees' social activities is happily blended and presented each month in the Phoenix Gazette, the November number of which is available (2d.). It is a bright and cheerful little magazine, conveying the impression that it reflects the "goings on" of a happy family business.

BROOK MOTORS, LIMITED, Huddersfield—Most of the items in the latest (Vol. 23, No. 97) issue of the Brook Magazine are news of the company and its subsidiaries, but there is one technical article, "Speed Control of Small Shaft-mounted Motor-driven Fans," by P. B. Greenwood. There is also the second article in the series in which the pages of history are turned back; "Yorkshiremen of Old," in fact, goes back to the reign of Henry VIII and we read (and learn) about John Fisher, Bishop of Rochester.

HENRY WIGGIN & COMPANY, LIMITED, Publicity Department, 20, Albert Embankment, London, S.E.1—Two comprehensive articles dealing with the problem of corrosion are featured in the latest (No. 63) edition of Wiggin Nickel Alloys. These articles list the many variables affecting corrosion together with measures that can be taken to offset corrosive attack. In addition, they provide information on new materials developed by the company to help solve the increasingly complex problems created by new techniques and new processes in industry. Many other interesting features are included in this extremely well-produced magazine.

RICHARDS STRUCTURAL STEEL COMPANY, LIMITED, Phoenix Iron Works, Leicester—"The Drum with Drive—Thorite" is the title of a booklet issued by this company. The Thorite motorized drum is modern transmission equipment entirely British in conception, designed primarily for the safe, compact, and economical means of driving conveyors and elevators. It consists of a 3-phase stator rotor unit built into a driving drum, to which it is geared by an epicyclic gear train, providing a wide range of fixed speeds. All that is necessary is to install the drum at the driving end of a conveyor or elevator and connect the leads of an electric supply to the connection box of the drum. The 32-page illustrated booklet gives full details.

HILGER & WATTS, LIMITED, 98, St. Pancras Way, Camden Road, London, N.W.1—A significant instrumental advance in recent months has been the addition of a computer to the company's polyprints and polyvacs, so that it is now possible for these instruments to give analytical results in percentage concentration. The analyst no longer has to refer to calibration curves. The new computer is described briefly in the September issue of the Hilger Journal. A polyprint has been operating at the English Steel Corporation's laboratory at Sheffield for some time, and it has more recently been joined by a polyvac. Of no less importance in another field is the rise to importance of the maser; there is an article on the subject by Dr. O. S. Heavens, of the Royal Holloway College.

SOUTH AFRICAN IRON & STEEL INDUSTRIAL CORPORATION, LIMITED, P.O. Box 450, Pretoria—Only part of Iscor News is printed in our own language, but most issues of the magazine contain one or two articles in English. The October issue, for example, contains a feature on "Wider Use of Wide Plate." Increasing use is being made in industry of wide plate, product of the new 144-in. plate mill complex which has been in production at Iscor Works, Vanderbijlpark, since May of this year. As much as 5,300 tons of Iscor steel are used in a month to produce rail wagons at the Germiston factory of Dorman Long (Africa), Limited, which has a capacity of 120 of the bogie type per week. These wagons are used to carry a variety of loads throughout the Republic and neighbouring states. The story is told in "Iscor Steel on Rails."

BRITISH JEFFREY-DIAMOND, LIMITED, Stennard Works, Wakefield (Yorks)—The trepan shearer, a development of the Anderton shearer-loader, has been designed to improve product size, and it gives both larger coal and fewer fines. In principle, a web of coal is cut by the trepan head, the shearing drum following to remove top and bottom coal. The trepan shearer is fully described in publication No. 1536, while No. 1537 is concerned with the 100-h.p. BID Anderton shearer-loader. "Never has a mining machine been the subject of such continuous development as the Anderton shearer-loader, and its achievements are phenomenal," the leaflet says. In the latest version the magnamatic transmission has controls conveniently placed on the goafside. The 100-h.p. continuously-rated motor greatly improves performance. The shearing unit, too, is fully up to date.

BRITISH TIMKEN (division of the Timken Roller Bearing Company), Duston (Northants)—According to the November issue of Timken, "some automobile owners probably spent as much money lubricating their cars in a year as Revere Copper & Brass Incorporated spent on the three mills shown below." The mills "shown below" are a 9½ and 33 by 44-in. cold finish mill, a 12 and 35 by 62 in. aluminium finish mill, and an 18 and 45 by 62-in. aluminium rundown mill. The three mills are on Timken tapered roller bearings with standard tapered bore (TQIT) bearings on the back-up rolls. Operators of the two rolling mills in the Revere plant at Chicago report that after three years of operation, the original grinding marks were still clearly visible in the load zones of the back-up roll bearings, indicating no measurable wear, the article states. The magazine, as usual, contains a supplement giving news from the UK works of the Timken organization.

JOSEPH LUCAS (INDUSTRIES), LIMITED, Birmingham—

A brief review of the fascinating peculiarities and potentialities of crystal semi-conductor devices and of some of their uses in the products of the Lucas organization is given in "Achievement in Electronics," an elegant brochure issued with the annual report of the company. Within recent years a revolutionary new look has been given to electronic developments by the introduction of what are known as semi-conductor devices. These small units—the outcome of research into the physics of materials in solid form—have many advantages over the thermionic valve hitherto used in most electronic apparatus. In addition, they can be readily employed to fulfil other important functions. The company's engineers have quickly appreciated the advantages to be gained by the use of semi-conductor devices in the products of the organization; the brochure tells the story of these developments.

INTERNATIONAL NICKEL COMPANY (MOND), LIMITED, Publicity Department, 20, Albert Embankment, London, S.E.1—A new publication dealing with the properties and applications of nickel-containing magnetic materials has been issued under the title "Nickel-containing Magnetic Materials." It contains authoritative chapters on high-permeability nickel-iron alloys, magnetostrictive materials, alloys with low curie points, and permanent magnet alloys. Each section covers early development, uses, further progress, and recent investigations and applications for the particular range of materials under review. Charts and graphs illustrate the physical and mechanical properties of the various alloys and specific information is given on the available forms. The book also provides in tabular presentation a comprehensive survey of the properties of nickel-containing magnetic materials in several valuable appendices.

BRITISH CAST IRON RESEARCH ASSOCIATION, Alvechurch, Birmingham—The main articles in the November issue of the BCIRA Journal (available on subscription) are:—"Information, Please!" by Daphne S. Drake and M. R. Thibault; "Work Sampling," by A. A. Timmins; "Changes in Dimensions of Malleable-iron Castings," by C. T. Moore; "Notes on the Handling of Perchloric Acid in the Laboratory," by W. E. Clarke; "Effects of Coke Size on the Performance of a Cold Blast Cupola," by H. J. Leyshon and R. B. Coates; "Influence of Speed of Loading on the Impact Properties of Ferritic Nodular Iron," by D. G. White; "Use of BCIRA Test Rig for Evaluating Corrosivity on Antifreeze Solutions," by H. H. Collins and T. J. Glover; "Some Factors Influencing the Occurrence of Boil Defects in Wet Process Vitreous Enamel on Cast Iron," by J. V. Dawson; "Continuous Desulphurization of Cupola-melted Iron with Sodium Carbonate," by R. B. Coates and H. J. Leyshon.

Book Review

Foundry Moulding Sands of India. By Mohan, Krishnan, Nijhawan, Gupte, and Somayajulu. Council of Scientific and Industrial Research, Jamshedpur, India. 180 pp.; 16 illustrations; 147 tables. 30s.

HEAVY industrial development in India is now well advanced, and future projects are planned for the near future. The Indian foundry industry is in the process of being geared to these developments to cope with expansion of existing plant and demands from new industries. The common factor to the foundry industry is sand and clay suitable for mould and core making and, under the above conditions, greater quantities of known quality materials will be required.

The book takes the form of a monograph, tabulating the necessary data of many suitable sands and is divided, broadly, into two sections. Firstly, a general introduction of four chapters dealing with occurrence, basic characteristics and methods of testing, the latter describing in some detail the individual test procedure (although 10 blows of the standard rammer for making the shatter index test-piece is not routine practice).

The information given here forms the terms of reference for the second section of six chapters, tabulating and reporting specific data of 21 natural moulding sands, 11 crude-silica sands, 10 high-silica sands, one special sand (zircon), and four bonding clays. It is this second section that justifies publication. Each sand is dealt with separately, giving its geographical occurrence and the name of the company through which it is obtained. Physical and petrological examination, fusion and/or sintering point and moulding characteristics are dealt with exhaustively but concisely and, by way of a conclusion, recommendations are made as to its suitability to make castings of different types and materials.

Macrophotographs at 25 magnifications of each of the sands are reproduced quite clearly and give a good impression of the sand under investigation. Cumulative grading curves likewise help in this way, although interpretation from such a curve is difficult, the more simple block or line graph being preferred by the reviewer. However, the actual size grading percentages for each sieve number is also given, so that relevant information could be replotted to individual preferences.

High-temperature performance is adequately reported by means of tabulated data and photographs of prepared test-pieces fired at different temperatures. Moulding properties of the silica and special sands presuppose the additions of clay, water, etc. A standard addition of 5 per cent. Bihar bentonite with variable H_2O content puts these different sands onto a common footing for comparative purposes. The data is clearly tabulated.

Similarly, the chapter dealing with bonding clays uses a washed Rejmahal high-silica sand as a control, with variable clay and water additions. Both the Bihar bentonite and the Rajmahal sand are dealt with in their respective chapters.

The presentation of such a mass of detail always sets problems to both publisher and printer. It is thought that the individual sections within the chapters could have been made more disinct and the absence of an index makes the search for a single piece of information unnecessarily prolonged. Also the reviewer wonders how familiar even Indian nationals are of the geography and geology of their own sub-continent; a few clear maps would greatly assist in this respect.

Such a volume can have little value outside the field to which it is directed, but to the Indian foundry industry it would appear to be an absolute necessity, especially as it is intended to issue further booklets from time to time on similar lines as new sand and clay deposits are discovered and developed.

T. H. L. BOND.

Continuous Discharge Rotary Vacuum Filter

OFFERING increased efficiency and lower operating costs, a new type of rotary vacuum filter, known as the EimcoBelt filter, has been developed by the Eimco Corporation of America and is being manufactured in Gateshead by Eimco (Great Britain), Limited.

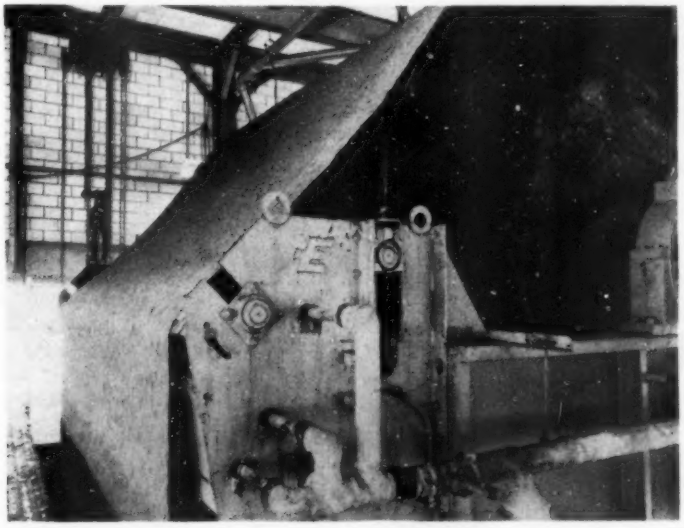


FIG. 1.—THE DISCHARGE OF "CAKE" FROM THE EIMCOBELT FILTER.

Outstanding feature of the new filter, shown in Fig. 1, is the means for removing the filter bed from, and returning it to, the drum in the course of each revolution which results in improved discharge of the filter cake. The use of a scraper blade or an air blow is dispensed with and the belt is washed before being returned to the drum. Thus a clean filter medium is always in use, giving sustained filtration efficiency and a reduced time for cleaning the belt.

Unlike conventional drum filters, it is not necessary to install a larger unit than is strictly necessary to overcome progressive blinding of the filter medium. The absence of a scraper blade reduces wear on the filter belt and increases its life. When belt changing is necessary a zipper joint in the belt enables this to be done in less than half an hour, compared with the 4 hr. to 8 hr. taken to change a conventional belt.

The continuous discharge rotary vacuum filter will find applications in the chemical, petroleum, food, mining, and iron and steel industries, and in sewage plants and general processing fields. The EimcoBelt filter is manufactured in standard sizes ranging from 18 in. dia. by 12 in. face to 14 ft. dia. by 16 ft. face. The smaller models are used in laboratories and pilot plants, while the larger types cater for almost any industrial filtration requirement. The freedom of these filters from medium blinding enables them to handle difficult slurries which cannot otherwise be filtered continuously.

In an American corn mill two EimcoBelt filters replaced a battery of plate and frame presses handling a difficult and sticky corn gluten. The blinding nature of the gluten made it necessary to wash the original filter cloths after each batch,

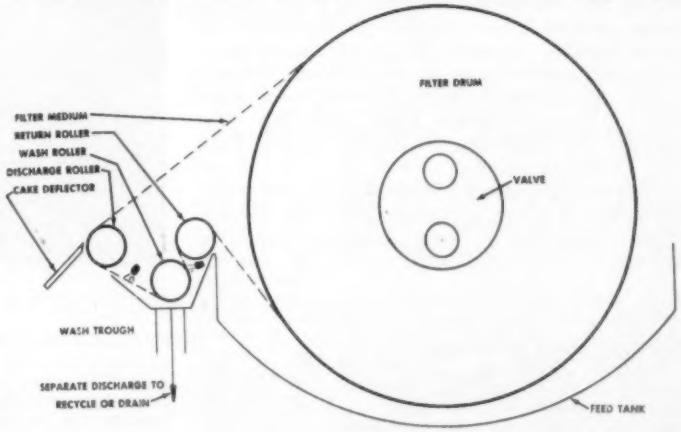


FIG. 2.—BASIC PRINCIPLE OF THE NEW ROTARY VACUUM FILTER.

whereas the stainless steel medium of the EimcoBelt filter operating continuously requires steam cleaning only once or twice a week.

Two EimcoBelt filters were installed in the purification and leach plants of an American cobalt refinery after severe blinding problems had been experienced with conventional drum filters. Blinding was immediately eliminated and total cobalt recovery rose from 93 to 97 per cent. in the purification plant and from 91 to 95.5 per cent. in the leach plant.

In each filter cycle the belt is removed from the drum and passed round a small diameter discharge roller (Fig. 2). The sharp change in radius causes the cake to break sharply away from the belt, and flexing of the belt extrudes cake from the weave. After cake discharge the belt passes round a wash roller and is cleaned on both sides, by high-pressure jets.

These can be operated either continuously or intermittently, and the amount and force of the spray can be adjusted to meet operating conditions. Chemical washes may be introduced through the spray pipes to ensure complete cleaning.

One of the problems in the design of a belt-type rotary vacuum filter is that of maintaining belt alignment. If the belt is allowed to move sideways it may expose the drum decking with consequent loss of vacuum and contamination of the filtrate with feed slurry. In the EimcoBelt filter, the belt alignment is maintained automatically by movement of a special roller. Sensing microswitches detect belt movement and an electro-pneumatic mechanism capable of moving one half of this roller in either direction along its axis corrects the position of the belt.

A range of filter media is available to meet the requirement of any task. A special corrosion resistant woven metal belt with an exceptionally long service life can be used with coarse or fibrous solids. This type has been widely employed on sewage sludges. Belts resistant to almost any form of chemical attack can be chosen from a range of modern synthetic fabrics.

New Method of

MANUFACTURING CONVEYOR BELTING

AT the Leyland (Lancs) factory of BTR Industries, Limited, radioactive gauges record and control the thickness of p.v.c. coating being applied to fire-resistant underground conveyor belting. Some 4,500 ft. of similar p.v.c. belting, incorporating a continuous filament nylon stress member with a cotton cover warp and continuous filament nylon weft, has been supplied by BTR for NCB's Pit House Drift (Co. Durham).

This newly patented method of construction represents a major departure from the conventional methods of manufacturing conveyor belting.

Swedish-Finnish Ironworks

Koverhar Ironworks, a joint concern of the Swedish Stora Kopparbergs Bergslags A.B. and the Finnish Vuoksennika, established in April, 1960, is now understood to have begun production. The works will supply raw material in the form of phosphorus-free pig-iron to the parent companies, and is expected to produce some 250,000 tons yearly. Iron ore is to be taken from the Jussaroe field, an under-water ore field in the Baltic. Initial mining capacity will be 300,000 tons of ore, from which 110,000 tons of concentrate will be processed. While the exact ore body is not yet known, some 200,000,000 tons are indicated, with an iron content of 22 to 35 per cent.

Obituary

MR. F. THOMPSON-SCHWAB

Chairman of Balfour & Darwins Group

CHAIRMAN of Balfour & Darwins, Limited, the steel manufacturing group, Mr. Frank Thompson-Schwab died last Friday after a short illness. He was 70. Mr. Thompson-Schwab, who was also senior partner of Thompson-Schwab & Company, London, stockbrokers, was for 12 years chairman of Darwins Group, Limited, which merged with the Sheffield steel group, Arthur Balfour & Company, Limited, last June to become Balfour & Darwins. He became chairman of the new holding company, with Lord Riverdale, chairman of Balfour, as deputy chairman.

Born in London, Mr. Thompson-Schwab was a Freeman of the City of London. He was educated at Clifton College, and in France and Germany. He founded the stockbroking partnership of Thompson-Schwab & Company in 1923, and it was not until 1957 that he entered the steel industry on his appointment to the chairmanship of the Darwins Group.

He was asked to take over the post by the Nawab of Bhopal (who at that time owned 90 per cent. of the shares) at a time when the company was in financial straits, and his 12 years' chairmanship saw its rehabilitation and expansion.

When he joined Darwins, the companies in the group were Darwins, Limited, Andrews Toledo, Limited, and Wardsend Steel Company, Limited. In 1953 Sheffield Forge & Rolling Mills Company, Limited, a nationalized concern, was acquired, and in 1956 J. Stead & Company, Limited, screwdriver makers, was added. In 1957 Darwins Bright Steels, Limited, was formed to concentrate production of bright bars and wires.

Mr. Thompson-Schwab, who had recently returned from America, was a Freeman of the Cutlers Company.

MR. J. W. SIBERG

FORMER managing director of the Skefko Ball Bearing Company, Limited, Luton (Beds), Mr. Johan Wilhelm (Ville) Siberg died at his home in Gothenburg, Sweden, last Saturday. He was 73. During the last war Mr. Siberg worked hard for allied victory both politically and as managing director of a company manufacturing a product vital to the country's war effort. In 1943 he flew to Sweden in the bomb bay of an unarmed Mosquito aircraft to forestall the Nazis applying pressure to the Swedes to increase their exports of ball bearings to Germany following the heavy raids on German ball-bearing factories.

After a technical education at the Royal Technical University, Stockholm, he joined the SKF organization in Sweden in 1918, and in 1925 was appointed works manager of what was then the Swedish company's English subsidiary. In 1931 he was appointed to the board of Skefko later becoming managing director. It was during his time as managing director that, in 1936, Skefko became a British public company. Mr. Siberg was a past chairman of the Society of Swedish Engineers in Great Britain.

MR. GEORGE PLEWS

MANAGER of the sales department of the English Steel Rolling Mills Corporation, Limited, a subsidiary of the English Steel Corporation, Limited, Mr. George Plews has died after a long illness. He was 61. Mr. Plews joined Vickers, Limited, in 1914, as an office boy and the following year moved into the main offices of the smithing and stamping department. When the English Steel Corporation took over he worked first as a sales order clerk, rising to section leader of the sales department, and eventually becoming manager.

Mr. Plews was widely known as the English Steel representative to 15 industrial organizations, including, the Alloy Steels Association, the National Billet Association, the National Association of Rolled and Re-Rolled Products, the Stainless Steel Manufacturers' Association, the Midland Forgemasters' Association and the Midland and Welsh Steelmakers' Association.

For many years president of the Darfield Main branch of the National Union of Mineworkers, Mr. WILLIAM SCHOFIELD has died at the age of 60.

The death has occurred, at the age of 64, of Mr. JOHN CROSSLAND, director of studies and assistant principal at the National Coal Board Staff College, Chalfont St. Giles (Bucks), for nearly five years.

The death has occurred of Mr. N. FINCH, Leeds area manager of Crofts (Engineers), Limited, Bradford (Yorks). Mr. Finch, who was 41, joined Crofts 12 years ago as a technical sales engineer in the Sheffield area and had been manager of the Leeds office since January, 1958.

The death occurred on Monday, after a few days' illness, of Prof. JOSEPH HUSBAND, senior partner in the firm of Husband & Company, consulting engineers, of Sheffield. He was 90. Prof. Husband founded the Department of Civil Engineering, Sheffield University, and held the first Chair of Engineering there, retiring in 1936. He was a holder of the James Watt Medal and was a member of the Institution of Civil Engineers for 64 years and of the French Society of Civil Engineers for 58 years.

Joint Managing Director of Thos. W. Ward

DEPUTY chairman and assistant managing director of Thos. W. Ward, Limited, Sheffield, Mr. ARNOLD CARR has been appointed joint managing director. Mr. Carr, who is 59, joined the company in 1915 as a commercial apprentice and in 1926 went to London to open up a southern branch of the foundry department.

MR. ARNOLD CARR

He was appointed a local director in 1936, and elected a director in 1941, becoming resident London director in that year. He returned to the company's head office in 1954 as assistant managing director, and became deputy chairman four years later. Mr. Carr, who is also chairman and a director of a number of home and oversea companies in the Thos. Ward group, has been closely identified with the activities of the Foundry Coke Merchants Association and the Pig Iron Merchants Association, in both of which he has held high office.

SCOW DEVELOPMENT LOWERS TINPLATE PRICE

MECHANICAL developments by the Steel Company of Wales, Limited, have made possible a considerable reduction in the price of heavy gauge tinplate. The company is now able to use the electrolytic coating process for thicknesses up to .0237 in. and tinplate of this gauge can be offered for less than £60 a ton.

Electrolytic coating is the standard process for thinner plate, but heavier gauges until now have been normally coated by the hot-dip process, which tends to leave a heavier, and thus more expensive, coating of tin. When depositing the tin by electrolytic methods, coatings as low as 4 oz. per basis box can be achieved, resulting in a considerable saving in costs.

Indian Steel Plant Capacity to be Raised to 2,500,000 Tons

RUSSIAN project for the expansion of the Russian-built Bhilai steel plant from the present 1,000,000 tons a year to 2,500,000 tons at an estimated cost of $32,000,000, including $12,600,000 in foreign exchange already provided by the Russians, has been approved by the Government of India.

When fully commissioned, the expanded plant will produce 500,000 tons each of rails and merchant sections, 250,000 tons of heavy structurals, 300,000 tons of wire rods, and 400,000 tons of billets, making a total of 1,950,000 tons. The expanded plant will also produce 300,000 tons of pig-iron.

The Scrap Markets

Merchants Faced with Many Problems

MANY problems occupy the minds of scrap merchants these days, and they are not concerned only with the doldrums which has becalmed the trade but with the many implications attaching to Britain's entry into the Common Market. Deliveries of steel-making scrap are still being severely restricted and there is nothing to suggest an early improvement.

Cleveland—Steelworks buyers of scrap are cutting down their orders to a minimum with the result that relatively small tonnages of scrap are leaving the scrapyards at only intermittent periods instead of the regular flow which high level outputs demanded.

Scrap orders from the foundries are steady and are based largely on the work received from the busy engineering concerns for castings and forgings. Deliveries of short heavy steel and the heavier grades of cast-iron scrap are better in some districts than others. Since the relaxation of the export ban on lower grade scrap not much business has been done with oversea customers who are offering low prices.

Scotland—There is little or no change in the iron and steel scrap market throughout Glasgow and the west of Scotland. With the quota system still in operation merchants continue to be restricted in their weekly deliveries. There appears to be the usual seasonal falling off in trade and this can largely be accounted for by the shorter hours of daylight. Deliveries to the steelworks are being regularly maintained at the restricted level and merchants are experiencing no difficulty in fulfilling their obligations.

The output of steel turnings is fairly well up to average but this class of scrap is becoming increasingly difficult to dispose of as consuming works are being extremely selective in the type of material they take in. The production of cast-iron borings continues fairly strong and there is no difficulty in disposing of any quantities that do arise to the blast furnaces.

At cast-iron foundries the demand continues reasonably strong and there is little difficulty in disposing of any parcels of cast-iron scrap that come on the market.

South Wales—Merchants are having an extremely difficult time. Each week conditions tend to worsen rather than to show any sign of an improvement. Local steelworks and iron foundries are refusing to accept supplies of scrap, and merchants are finding that the market is at a complete standstill. With the closure of works in the area, and the threatened closure of others it is felt that South Wales iron and steel scrap industry is going to find it extremely difficult in getting back on to an even keel even when the national situation has righted itself.

IT IS reported that Ruhr coalowners have formed a company to further exports to countries outside the Common Market. The company, called Hueko, aims to sell to the iron and steel industry.

NEW COATINGS DIVISION has been formed by Corrosion Technical Services, Limited, a subsidiary of John Mowlem & Company, Limited, for the manufacture and application of chemical-resistant coatings and linings. The new division will undertake, both at its works and on site, the complete preparation (including shot-blasting) and application of linings and coatings to chemical plant, vessels, pipeworks, and ducting.

IRON AND STEEL TRADE

WHILE the home market continues dull with a fall in the demand for most heavy products, exports are being increased. However, it is questionable whether, throughout the full range of operations, blast furnaces, melting shops, and rolling mills are as much as 75 per cent. engaged, and it can only be hoped that further short-time and redundancy will not be necessary before trade takes a turn for the better. The sooner the process of stock reduction is over the more likely there will be of an increased flow of orders, but some of the larger steel users may carry their stock reductions to a very fine limit.

Pig-iron

Although less than three quarters of existing blast furnaces are now in production and a number of these are working below capacity, outputs of all grades of pig-iron are more than adequate to meet the demand. Basic pig-iron, which comprises about 75 per cent. of overall outputs, is being supplied on a much reduced scale to the steelworks, but fairly substantial consignments have been exported.

All grades of foundry pig-iron continue plentiful, the easy supply position and uncertainty of forward business restricting deliveries to those required for current consumption.

Ferro-alloys

In general the demand for most items is running at a lower level; ferro-tungsten and low carbon ferro-chrome are quiet, but the high carbon grades are in steady request. Ferro-silicon and calcium silicide are well supported and interest in ferro-manganese is maintained.

Ferro-titanium and ferro-niobium also are quieter, but there is a fair demand for ferro-molybdenum. Ferro-vanadium is less active.

Semi-finished Steel

Many of the re-rollers are working a reduced number of shifts, but they are still finding it difficult to match demand with capacity. The orders for small bars, light sections, and strip are insufficient to make up rolling programmes and numerous roll changes are involved.

The call for supplies of mild steel billets, etc., has shrunk to very low levels and many steelworks are finding it increasingly difficult to dispose of arisings of defectives and crops.

Finished Steel

There is little change in the situation and an optimistic note cannot yet be struck in any sector of the trade. Though the demand for all kinds of steel plate is reasonable, increased capacity provided by new plant means that there is no pressure on makers. Further orders could easily be absorbed into current or forward programmes. Much the same situation applies to flat and corrugated galvanized sheets.

Favourable delivery dates are being quoted against new inquiries for good commercial quality, high carbon, and special quality bright bars, but business is very keen and prices and delivery dates have to be pared to the minimum to secure orders.

AWARDS, PRESENTED by Mr. C. Cooke, principal of Rotherham Technical College, were received by 106 apprentices at Brown Bayley Steels, Limited, Sheffield, on Wednesday of last week.

Iron-ore Imports

IMPORTS of iron ore and concentrates (except chrome iron ore) and roasted iron pyrites in October, and the totals for the first 10 months of this year and last, are shown in the table below.

From	Month ended Oct. 31	Ten months ended October 31	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Sierra Leone	61,380	613,372	475,661
Canada	322,441	2,966,134	2,187,545
Other Commonwealth countries and Eire	810	24,389	9,586
Sweden	330,740	3,944,894	4,042,098
Norway	14,200	268,475	235,955
France	29,040	467,120	396,925
Portugal	6,731	322,927	133,468
Spain	82,967	637,158	616,765
Algeria	107,595	1,716,626	1,280,955
Tunisia	56,210	595,785	403,428
Morocco (including Tangier)	33,110	642,652	450,834
Liberia	13,850	415,530	402,461
Venezuela	92,268	1,378,462	1,509,411
Brazil	29,294	502,969	479,628
Other foreign countries	33,074	652,340	519,166
TOTAL	1,214,340	15,148,833	13,143,886

Britain Falling Behind in Technical Training

BECAUSE of failure to provide sufficient university and technical training, Britain is steadily falling behind Russia and America in the field of education, Dr. J. Burns, president of the Institute of Fuel, said last Friday. He told members of the East Midland section of the institute, at its annual dinner in Nottingham, that the institute was helping to fill the gap by providing valuable training within the fuel industry. It was determining its own educational standards and supervising its own examinations.

Dr. Burns, who is deputy-chairman of the North Thames Gas Board, said that in London and the various regions, the institute's technical meetings were performing a useful function by allowing students to discuss their work and gain valuable experience without having to go to university.

THE ENGINEER'S TOOLS DEPARTMENT of George Cohen Sons & Company, Limited, moved to the company's new machine-tool headquarters at 23-25, Sunbeam Road, London, N.W.10, on Monday. The telephone number is ELGar 7222.

Coalfield News

Miners to Take Own Cook to Italy

FIFTY Derbyshire miners who are spending a holiday at Riccione on the Italian Adriatic coast are planning to take an English cook and a lorry load of beer with them. Mr. Bert Wynn, secretary of the Derbyshire Area of the National Union of Mineworkers, which is organizing the £40 all-in holiday, said: "The last time they went to Italy the sea was marvellous and the weather fine, but the food was terrible. The men want real English food and home cooking."

Last year the men took with them a side of bacon and a crate of tea. "But the Italian cooks boiled the water and left it for a time before pouring it on the tea," said Mr. Wynn. This year, the task of providing food for the miners has fallen to a cook from the Skegness Miners Holiday Centre.

MINERS IN DERBYSHIRE are to give between 1d. and 3d. a week to give retired miners a holiday at Skegness or Rhyl once every two years.

"DEAR STRIKER," the first play by Mr. Clarence Stafford, an underground worker at Steetley Colliery, near Worksop, is being produced at the Chesterfield Civic Theatre.

THE Association of County Councils for Scotland has asked members affected by pit closures to prepare memoranda giving details of the effects on local authority services.

OVERALL OMS at Victoria Colliery, Biddulph (Staffs), during the week ended November 25 was 114.4 cwt. beating the previous record of 113.6 cwt. set up in March this year.

SHIPMENTS OF COAL from South Wales ports last week showed an improvement of 14,448 tons compared with the previous week, and of 17,539 tons compared with the corresponding week of last year.

ANOTHER INCREASE—of 0.93 cwt.—in overall productivity in the Durham Division of the NCB is reported for the first 47 weeks of the year. OMS averaged 23.13 cwt. and at the face, reached 65.97 (64.60) cwt.

COAL AND COKE SHIPMENTS through the port of Garston, Liverpool, for November totalled 75,109 tons. Principal shipments of coal (64,438 tons) were to Northern Ireland and 3,661 tons of coke were shipped oversea.

LONG SERVICE certificates were presented to 26 miners at Bentley Colliery, near Doncaster (Yorks), last Friday. Each has spent 50 years in the mining industry and nine of them have served the whole time at Bentley.

NATIONAL COAL BOARD has named January 17 as the earliest date by which it could reply to the wages and hours claims of the National Union of Mineworkers. This is over a month later than the date the union has been asking for.

THE WEEK-OLD go-slow strike by 70 miners at Coppice Colliery (Derbyshire), ended on Monday to enable negotiations to start. The men claim that conditions make it difficult for them to maintain their average earnings.

WASTE FROM THE mines at Blackhall, West Hartlepool, killed the seaside holiday trade and Deneholme House, a former hotel, which was closed, has been bought by the National Coal Board and converted into three homes, for miners and their families.

MR. JOSEPH CUTTS, a 71-year-old miner, who has just retired from Mansfield Colliery (Notts), ends a total of 254 years' service by himself and his four brothers at the colliery. His brothers, aged from 73 to 68, each spent a minimum of 50 years at the pit.

LANARKSHIRE MINER, Mr. Mike McGahey (36), defeated Mr. Alex Eadie for the vice-presidency of the Scottish Area of the National Union of Mineworkers. The executive council of the South Wales Area has appointed a Scot, Mr. Michael Walsh (33), as education officer.

COKE OVENS at Handsworth, Dinnington, Cortonwood, and Rotherham Main (Yorks), are to be closed by the National Coal Board during next year. Between them the coke ovens employ 400 men, but redundancy is not expected because of the demand for labour in the mining industry in the districts affected.

AGREEMENT HAS been reached between the Northern (N&C) Divisional Coal Board and the National Union of Mineworkers, regarding the closing of Seghill Colliery, Northumberland, in the second half of 1962. About 700 miners are affected, but as a result of a transfer scheme, no redundancy is expected. Some 100 men will shortly be transferring to Rising Sun Colliery, Wallsend.

IF COALVILLE (Leics) Urban Council goes ahead with its plan to set up a smokeless zone at the local Greenhill council estate, two miners, who live on the estate, have threatened to urge a protest strike at Leicestershire pits. As, they say, there is no coal in Leicestershire suitable for making coke or smokeless fuel, they object to burning coke made from Yorkshire coal, instead of coal from local pits. The strike threat has been made without union backing.

Mass Lobbying on Scots Pit Closures Planned

MASS lobbying of MPs is planned early in the New Year by four unions as part of a widespread campaign against the contraction of the Scottish economy by the closure of collieries and the cutting of transport services. The move has been agreed to by the Scottish Area of the National Union of Mineworkers, the Scottish Enginemen and Boilers' Trades Association, the Clerical Workers' Union and the Colliery Officials and Staff Association.

This was announced after a meeting of the unions' representatives in Edinburgh on Wednesday by Mr. Alex Moffat, president of the Scottish Area of the National Union of Mineworkers, who said it had also been agreed to press for a public inquiry into the management, planning, mechanization, and financial policy of the NCB.

NEW OUTPUT RECORDS IN EAST MIDLANDS PITS

ALL records in the East Midlands Division of the NCB were broken in November, the board stated on Wednesday. In four weeks—20 workings days—the 87 pits in Nottinghamshire, Derbyshire, and Leicestershire, which provide nearly a quarter of Britain's coal, produced 3,790,000 saleable tons—26,500 tons more than the old record. It was the highest monthly output for three years, and was achieved with 11,270 fewer men.

The coal-face output of 132 cwt. per manshift was also a national record, and the average output per shift for all employed was over 46 cwt. More than 72 per cent. of the coal mined in the East Midlands is mechanically loaded at the face.

THE COAL TRADE

COLDER weather is giving the expected impetus to business in domestic coal, and industrial and commercial central heating needs are expanding rapidly. Movement of supplies from pits has been encouragingly smooth, and it is hoped that the areas which have had snow will not suffer any lengthy traffic interruptions. Shortages of coals, apart from the anthracite section, are confined to specific popular varieties, and surpluses of certain types, where they still exist, will undoubtedly disappear if the cold spell persists.

LEICESTERSHIRE

House coal remains firm and while there are a fair number of orders placed in anticipation of Christmas, supplies are exceptionally good for the time of year, most grades being promptly despatched by rail. Quick runs into depots have also helped considerably Although late in the year, larger distributors are even now taking advantage of available supplies and placing to stock.

There is little change in the situation with regard to Rexco and Coalite. Supplies are quite difficult to come by and there appears no possibility of supplying the present demand. Cleanglow, on the other hand, is in good supply as is Gloco, and these two are taking the main smokeless fuel load. The better grades of anthracite show no improvement, but the lower grades are more plentiful and, although distributors are sometimes having to accept these grades to satisfy demand, it is with considerable reluctance.

Foundry coke is plentiful and local industry is well provided. The central heating market is very firm, but the supply position is entirely satisfactory. All supplies of coke for this purpose are despatched quickly by rail. The industrial coal market remains exceptionally good, with new appliances using industrial coal operating satisfactorily.

All supplies of DS nuts, doubles, singles, and washed smalls are obtained without difficulty.

1,000,000 Tons from Two More Notts Pits

AS the result of increased mechanization, three Nottinghamshire collieries, Gedling, Bestwood, and Thoresby, have produced 1,000,000 tons of saleable coal this year. Gedling Colliery reached the target three weeks ago, to be followed on Wednesday of last week by Bestwood Colliery, where fewer miners achieved the 1,000,000-ton mark 16 days earlier than last year, and in spite of some difficult geological conditions.

They reached the target only hours ahead of Thoresby, where in recent weeks overall OMS has risen to a record 60 cwt.—twice the national average—with a smaller labour force.

PORT of Blyth (Northumberland) is taking over the lead from the River Tyne as Britain's biggest coal shipping port, and by the end of the year is expected to have beaten its own pre-war record. In 1936 the port shipped a record 6,788,266 tons of coal, and by the end of October this year had shipped 5,677,461 tons against the Tyne's 5,077,948 tons. Blyth is now well past the 6,250,000-ton mark, and sometime next week is likely to pass its post-war record year's shipments of 6,355,000 tons, set up in 1951.

More Coal—and More Miners

WITH four weeks to go, total output of saleable coal this year should just top 190,000,000 tons. A further increase—to 4,104,200 tons—is reported for last week, although open-cast output dropped by 12,000 tons. Colliery manpower for the week ended November 25 again showed a rise—of 50 overall and 190 at the face. The upturn began three weeks ago, but fell back slightly in the week ended November 18.

Consumers' stocks remain around 18,140,000 tons, but undistributed stocks have fallen slightly.

There were 561,830 wage-earners on colliery books on November 25, against 584,740 on November 26, 1960, the numbers engaged at the coal face being 209,920 and 221,000 respectively. Output at the face was 4,374 tons and overall 1,526 tons in the week ended November 25, compared with 4,096 and 1,447 tons in the week ended November 26, 1960.

The following table gives (in tons) the provisional figures of output of saleable mined coal by division in the week ended December 2, and the tonnage lost through disputes:—

Division.	Week ended December 2, 1961.		Week ended December 3, 1960.
	Total output.	Tonnage lost.	Total output.
Scottish	362,000	9,000	348,000
Northern (N&C) ..	247,000	—	246,000
Durham	459,000	—	471,000
North-Eastern ..	873,000	2,000	843,000
North-Western ..	257,000	—	262,000
East Midlands ..	967,000	4,000	923,000
West Midlands ..	310,000	—	289,000
South-Western ..	391,000	1,000	382,000
South-Eastern ..	32,000	—	34,000
Great Britain—			
Deep-mined coal ..	3,898,000	16,000	3,798,000
Other deep-mined (including licensed mines) ..	161,000	—	156,000
TOTAL	4,104,000	16,000	3,992,000

GLOUCESTER RAILWAY CARRIAGE & WAGON COMPANY, LIMITED—In a further letter to shareholders, the chairman, General Sir William Morgan, says that the board emphatically disagrees with much of the comment by Mr. Scammell, the stockholder who criticized the terms of the offer made by Winget, Limited. Winget will not increase its offer and no other is forthcoming. As to liquidation, Sir William says the outcome would not be more advantageous as repayment of capital would be subject to costs and there would be no income in the interim period. The sale of the business as a going concern would involve further trading losses until a sale was effected, which might take some time. Support actually notified for rejection of the Winget bid now exceeds 30 per cent.

Orders Placed

Cladding for Tinsley Park Steelworks

CONTRACT worth £400,000 has been placed by the English Steel Corporation, Limited, with Robertson Thain, Limited for the cladding of the major buildings for its £26,000,000 Tinsley Park project at Sheffield. Both roof and side cladding will be of Galbestos sheets which have a steel core, a multiple layer of anti-corrosion treatment, and a coloured plastic surface.

Advantage is being taken of the range of colours to give an attractive external appearance, and pleasant working conditions.

AN ORDER FOR additional switchgear equipment, valued at £13,400, is to be supplied by J. G. Statter & Company, Limited, London, S.W.1, a member of the Metal Industries, Limited, group, to the Sheikdom of Kuwait.

WORTH £7,000, an order for oxy-acetylene equipment, including welding and cutting blow-pipes and spares, has been received from Cuba by the Suffolk Iron Foundry (1920), Limited, a member of the Qualcast, Limited, group.

PUMPS OF ADVANCED design for the new graving dock at Greenock (Renfrewshire), which will be one of the world's largest, have been ordered from Drysdale & Company, Limited, Glasgow. The electrically-driven pumps will have a 60 in. bore giving them a combined capacity of 255,000 gallons a minute.

HEAVY PLANT DIVISION of Associated Electrical Industries, Limited, has received orders, worth £150,000, for electric motors from several companies, including the Broken Hill Proprietary Company, Limited, Svenska Esso, AB, of Sweden, and the Billingham division of Imperial Chemical Industries, Limited.

FURTHER ORDERS received by Laurence Scott & Electromotors, Limited, for electric motors for Vales Point power station, New South Wales, bring the total value of contracts in hand for this station to over £300,000. The motors being supplied are to the specifications of International Combustion, Limited, and James Howden & Company, Limited.

RECENT ORDERS secured by the Newall Engineering Company, Limited, Peterborough (Northants), include one, worth £160,000, from Metalexport of Poland, for machine tools covering 32 different items of equipment and another, valued at £140,000, from Strojimport of Czechoslovakia, for nine special-purpose heavy-duty grinders to be used in the manufacture of automotive components.

TWO ORDERS covering the supply and commissioning of 40 flue dust monitors have been placed with the electronic apparatus division of the Associated Electrical Industries, Limited, by Babcock & Wilcox, Limited, London, N.W.1. The equipments are to be installed at power stations at West Thurrock (Essex) and Rugeley (Staffs)—20 at each site. They are required for the main boiler construction programme.

ORDER has been received by Wright Boag & Head Wrightson (Pty.), Limited, of South Africa, an associate company of Head, Wrightson & Company, Limited, Thornaby-on-Tees, for the supply of a multi-purpose column to the State-owned oil-from-coal plant, SASOL. The vessel will be 88 ft. long and will weigh 50 tons without the internal equipment. It is to be of all-welded construction, 9 ft. 10½ in. in diameter, with ¾ in. thick shell plating and ⅞ in. thick dished ends.

Polish Metallurgical Delegation in UK

SIX-MAN delegation representing Poland's metallurgical industry arrived in Britain last week-end for a fortnight's tour, sponsored by the London Chamber of Commerce and the Federation of British Industries. A spokesman for the London Chamber of Commerce said that the expansion of Poland's iron and steel production will require the purchase of much additional plant and equipment, and the Polish authorities are anxious to place orders for this equipment in Britain wherever possible.

The party includes specialists in all phases of the industry from mine construction to the fabrication of finished products. Members of the party representing the iron and steel industry are Mr. K. Morski, Mr. B. Prusinski, Mr. W. Lipinski, and Mr. M. Kowalewski. Works being visited by the party include those of Wellman Smith Owen Engineering Corporation, Limited, Morgan Crucible Company, Limited, Dosco Overseas, Limited, W. H. A. Robertson & Company, Limited, Elliott Automation, Limited, M. Falk, Limited, Steel Company of Wales, Limited, General Electric Company, Limited (Erith), Guest Keen & Nettlefolds (Cardiff), Limited, Delta Metal Company, Limited, and the metals division of Imperial Chemical Industries, Limited.

The Incandescent Heat Company, Limited, W. & T. Avery, Limited, Holman Bros., Limited, Davy-Ashmore, Limited, English Steel Corporation, Limited, British Aluminium Company, Limited, Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited, Yorkshire Imperial Metals, Limited, Head Wrightson & Company, Limited, the National Coal Board (Monktonhall), British Oxygen Company, Limited, Enfield Rolling Mills, Limited, Constructors John Brown, Limited, British Insulated Callender's Cables Limited, and Blaw Knox, Limited.

Meanwhile, directors of six Scottish engineering firms, together with Mr. G. B. Young, London secretary of the Scottish Council (Development and Industry) left London on Monday on a trade mission to Poland. The six companies—G. & J. Weir, Limited, Motherwell Bridge & Engineering Company, Limited, North British Locomotive Company, Limited, Brown Bros., Limited, Bruntons (Musselburgh), Limited, and Imex Engineering, Limited—have agreed to act as a consortium in order to be able to quote for complete plants.

International Standards Needed in Metal Finishing

RESEARCH manager of the International Nickel Company (Mond), Limited, Mr. G. L. J. Bailey asked for international standards in sheet metal finishing in his presidential address to the Institute of Metal Finishing in London on Monday. Stressing the importance of such standards for the Common Market, he said, "We should support, and indeed take a lead, in this endeavour." The Common Market offered glittering opportunities to the successful, he added.

If standards could be agreed upon, Mr. Bailey went on, producers would be able to compete in terms of price and delivery, and the emphasis would have to be on productive efficiency.

Company News

NEEPSEND STEEL & TOOL

Improvement in Export Business

DESPITE difficulties in the year's trading, full working production was maintained by the Neepsend Steel & Tool Corporation, Limited, Sheffield, throughout the year to March 31, 1961, which has continued up to recent days, although there is now a slight falling off in the activities of certain smaller companies in the group. This, however, is not expected to have really serious effects, says Sir Stuart C. Goodwin, president, who adds that the board expects, unless unforeseen conditions intervene, to be able to present a satisfactory profit position next year.

Sir Stuart, in his annual statement, says that export trade has improved considerably during the past year, and every opportunity is being seized to develop trade oversea. The expense in getting such business, he emphasizes, is heavy and the prices which have to be quoted to secure orders are extremely keen with a consequent decline in profit margins.

A careful watch is kept on technical developments everywhere, he says, and when information is received about machines and plant which might offer greater efficiency than those already in the works, immediate steps are taken to view them no matter in what part of the world they may be. If these machines, in fact, offer an advance, they are acquired immediately.

Thos. Firth & John Brown Profits Maintained

CONSOLIDATED profits of Thomas Firth & John Brown, Limited, which specializes in the manufacture of special and stainless steels, was little changed for the year ended September 30, 1961, at £4,425,251 against £4,490,740, after charging £869,752 (£733,642) for depreciation, and debenture interest of £125,167 (£129,543), and crediting investment income and other interest.

A net balance of £1,915,421 (£1,811,331) remains after deducting tax and allocating £537,000 (£625,000) to capital reserves, representing additional depreciation towards the increased cost of replacing fixed assets. Final dividend is declared at 7½ per cent. making an unchanged total of 12½ per cent.

Heavy Fall in Consett's Half-year Profits

HEAVY fall in profits for the first half of its current year is reported by the Consett Iron Company, Limited, and consideration of a dividend is postponed until the full year's results are available. The half-yearly figures to September 30, which are published by the group for the first time, show that trading surplus fell 28 per cent. to £1,681,540 from £2,351,644 for the corresponding period of 1960.

The profit available for appropriation, after all charges, has fallen from £997,946 to £188,010, almost exactly the amount required to meet last year's interim payment of 3 per cent. Previously, this was followed by a final dividend of 6 per cent., costing another £398,000.

IMPERIAL CHEMICAL INDUSTRIES OF AUSTRALIA & NEW ZEALAND, LIMITED—Consolidated profits fell to £A2,135,000 (£A3,082,000) for the year to September 30, 1961, and with a final of 4 per cent. the total ordinary dividend is held at the previous year's equivalent of 7 per cent.

JOHN FOLKES GROUP, LIMITED—The group has acquired the issued capital of British Industrial Tool Supplies, Limited, which carries on the business of manufacturing dropforgings at its freehold premises at Lye, near Stourbridge. The consideration has been satisfied by the allotment of 1,000,000 ordinary 1s. shares.

UNITED WIRE WORKS, LIMITED, Birmingham—Profits for the year to end-September, 1961, expanded from £839,744 to £993,437, and, after tax, the net balance is £561,506 (£501,642). The tax-free dividend total is raised by 2 per cent. to 22 per cent. with a 16 per cent. final, but the bonus payment, not subject to tax, is halved to 1 per cent.

FOUNDRY EQUIPMENT & L. & Y. HOLDINGS, LIMITED—There was a group net loss for the year ended March 31, 1961, of £39,367 (£18,351 profit) and no ordinary dividend is being paid compared with 5 per cent. previously. Main cause of the loss, states the chairman, Mr. A. S. Beech, is the difficulty experienced in endeavours to expand the export trade.

R. & J. DICK, LIMITED, manufacturers of belting, of Glasgow—Group profit for the year to August 31, 1961, before tax, fell to £52,472 (£136,122) and the dividend is reduced to 10 (17½ equivalent) per cent. The directors believe that the fall in the parent's profits is temporary, while realizing that the recent poor results of the American companies will again be reflected in the next accounts.

STANLEY WORKS (GREAT BRITAIN), LIMITED, manufacturers of joiners' tools, of Sheffield—The company has agreed to purchase for cash from John Brown & Company, Limited, and from the minority holders, all the shares in S. N. Bridges & Company, Limited, manufacturers of power tools, etc., of London, S.W.6, subject to the necessary consents being obtained. John Brown has a 97½ per cent. interest in Bridges.

N. GREENING & SONS, LIMITED, manufacturers of wirecloth and metal perforators, of Warrington (Lancs)—For the first six months of the current year group

turnover and profits are above the average for the previous year and if present trends continue, profit for the full year should show a slight increase on that for last year. Export sales have increased nearly one third over the corresponding period for 1960.

DUPORT, LIMITED, ironfounders, engineers, etc., of Tipton (Staffs)—Shareholders are warned that unless trading conditions begin to show an improvement in the relatively near future, the ordinary dividend may have to be reduced. The chairman, Mr. W. L. Barrows, states that the cost of the new bar mill will have to be financed by raising new permanent capital but as times are not propitious for this step, arrangements have been made with the bank.

THOMAS BLACKBURN & SONS, LIMITED, constructional engineers and ironfounders, of Preston—Orders in hand for 1961-62 considerably exceed comparable figures for the previous year, and current production shows a similar improvement, state the directors. Trading profits in the year ended June 30, 1961, amounted to £52,687, compared with £22,505 previously, when the balance was increased by £37,997 net credits related to prior years.

JOSEPH LUCAS (INDUSTRIES), LIMITED—Net profit for the year ended July 31, 1961, is £2,526,350 (£2,923,424), and directors recommend a final dividend of 2s. 3d. a share on the ordinary and redeemable preference, which, with the interim, makes 2s. 9d. for the year, as previously. Export business during the year reached a record turnover, despite the setback to vehicle exports generally, and increasing competition.

METAL TRADERS, LIMITED, non-ferrous metal and ores merchants and brokers, of London, E.C.3—In his statement, the chairman, Brig. H. P. Crosland, explains that in spite of expert advice and considerable reorganization the improvement hoped for last year has not materialized in respect of the subsidiary, Watford Foundry Company, Limited. As further mechanization, requiring large capital expenditure, was needed to make the factory competitive, and this did not seem justified production of iron castings ceased from October 31.

LONGMORE BROS., LIMITED, manufacturers of steel and conduit tubes, etc., of Wednesbury (Staffs)—At the annual meeting, Mr. Cecil Longmore, chairman and managing director, said that in view of credit restrictions and the unsettled state of trade generally, he felt it was unwise this year to attempt to make a forecast of the company's future prospects. Since the year ended August 4, 1961, the demand for some of the company's products has not been fully maintained, but he was confident that further progress will be made when the restrictions are eased.

BIRMID INDUSTRIES, LIMITED, manufacturers of alloys and castings, etc., of Smethwick (Staffs)—It seems unlikely, says the Marquess of Exeter, the chairman, that the present falling off in demand from the motor and other consumer industries will improve before the New Year. In certain directions the number of employees has been reduced and short-time working was recently introduced in several foundries. Competition for available business is keener than ever before, so that in order to secure contracts, profit margins will have to be drastically reduced.

GAS PURIFICATION & CHEMICAL COMPANY, LIMITED—It is proposed to set up a management committee of three directors from the parent board, headed by the chairman, which will make recommendations on coordination, expansion, acquisitions, and capital expenditure and if, when thought fit, the elimination of companies in the group where the results are not considered satisfactory, having regard to the capital employed and where no expansion is considered practicable.

Common Market Will Jolt UK Traditions

SPEAKING to the Royal Society of Arts in London on Monday, Mr. Roger Falk, a director of Production-Engineering, Limited, said: "The Common Market will provide the biggest jolt yet to British industry. Let us hope that both management and labour, in their present myopic mood, will respond."

Mr. Falk, who is chairman of the Marketing Development Company, Limited, and the British Export Trade Research Organisation (1952), Limited, went on: "We are desperatedly slow to receive and accept new ideas, and seem rooted in tradition, and while so much of that tradition is good and has been tested by the exacting claims of time and experience, we take an age to cast off that which is bad, or, if not bad, at least anachronistic and outmoded." He suggested that the most serious attitude of all was that we somehow ought to be getting more than we give.

Regarding exports, Mr. Falk remarked that it is not the fun that had been suggested. "It is not easy, and not immediately rewarding," he said. "It calls for immense energy, a strong will and a good deal of faith."

Mr. Falk listed five features for any export effort by a company:—Sound market research; good design; economic and effective channels of distribution; after-sales service, and skilful promotion.

Higher Costs Force Down United Steel's Profits

LOWER group profits are announced by the United Steel Companies, Limited, for the year ended September 30, 1961, but the final dividend is maintained at the forecast rate of 7½ per cent. on £50,000,000. The year's total is equivalent to 12.3 per cent., allowing only for a one-for-four scrip issue made after the interim dividend. Previously 18 per cent. was paid on £30,000,000—prior to either issue—equal to 14.4 per cent., taking the scrip issue into consideration. After a heavier depreciation provision, the trading surplus is £16,810,000 against £22,920,000. The total surplus, after crediting (debiting) non-recurring and extraneous items, is £17,270,000 compared with £22,580,000.

The directors state that the main reason for the reduction of £5,307,000 in the total surplus was the increased costs which were in force throughout the year and for which little compensation was received from inadequate price increases, which covered only a small part of the year. The secondary reason was the reduction in operating rates, due to market conditions, which materially affected only the last quarter of the year.

NCB's New Information Centre

CHAIRMAN of the North-Eastern Divisional Coal Board, Mr. W. H. Sales, opened the fourth NCB Information Centre in Yorkshire, at Wakefield, on Wednesday of last week. The centre will provide a comprehensive information and advisory service for all types of domestic heating and cooking by solid fuels.

Mr. Sales referred to the centre as an expression of his faith and that of the Coal Board in the future prosperity of the Yorkshire mining industry.

NEWS IN BRIEF

WORK WAS RESUMED on Monday at Newton, Chambers & Company, Limited, ironfounders and engineers, etc., of Thorncliffe, near Sheffield, following a dispute which had kept the plant idle for a week.

FOR THE 25th time Glencairn Metals, Limited, has won the Motherwell and District Industrial Savings League. On this occasion the savings group of the firm has scored 113.55 points, seven points more than Russell's Brass Foundry, Limited, the second group in the league.

LARGE SHIPMENT of refractory materials for export to New Zealand by General Refractories, Limited, Sheffield, has been despatched from works in the Genefax group. Some 850 tons of refractories, destined for the largest plant of its kind in New Zealand, are involved.

BECAUSE OF AN INCREASE in demand for castings, short-time working at Ley's Malleable Castings Company, Limited, Derby, is to cease for a fortnight, it was announced on Thursday of last week. For the last nine weeks the foundry and allied departments had been on a four-day week.

IN AGREEMENT with the Allegheny Ludlum Steel Corporation, of Pittsburg, the Société Metallurgique d'Espérance-Longdoz, of Belgium, has set up a new company called Allegheny-Longdoz, which will make stainless and special steel, so that for the first time the company will make other than mild steels.

THREE FURNACES at the Clydesdale-Mossend (Lanarkshire) steelworks of Stewarts and Lloyds, Limited, are to be closed for a week because of heavy stocking and a shortage of orders. About 300 men will be affected. Short-time is to be introduced by Colvilles, Limited, at its Dalzell plant at Motherwell, because of the present slackness in the industry.

GENERAL MANAGER of Steel, Peech & Tozer, branch of the United Steel Companies, Limited, Rotherham (Yorks), Mr. T. S. Kilpatrick opened the firm's new £52,300 amenity centre, at Ickles, and another, costing £23,620, at the Fullerton machine shops, last Friday. The buildings provide changing rooms, and washing facilities, a conference room, and offices.

AN AGREEMENT has been reached between the F. J. Stokes Corporation, of Philadelphia, and Vacuum Industrial Applications, Limited, high vacuum pump manufacturers, of Wishaw (Lanarkshire), a member of the Lithgow Group, which will give the Scottish company the right to produce Stokes vacuum-induction furnaces and stream-degassing equipment, principally for the steel industry.

MONMOUTHSHIRE Federation of Trades & Labour Councils is to approach Richard Thomas & Baldwins, Limited, to seek its views on the setting up of a small airfield in the county. The federation considers that an airfield would be a great aid to industrialists, and is anxious for the leading firms in the county, with the co-operation of the county council, to build one.

CHAIRMAN OF Turners Asbestos Cement Company, Limited, Mr. Kenneth Neve presented long service certificates to 56 employees at a dinner held at the company's Widnes (Lancs) works last Saturday. This year 102 certificates will be presented throughout the firm's six factories. Over 12 per cent. of the present employees have now completed 25 years' service.

DELIVERY OF heavy units for the new hot strip mill at the Ravenscraig works of Colvilles, Limited, Glasgow, which are being built at Sheffield by Davy & United Engineering Company, Limited, is now under way by road and sea. This method of delivery will be used pending the completion by the end of the year of a major road bridge reconstruction at Ford in Midlothian.

FIGURES FOR the four-week period to November 5 show that only 16,859 tons of iron ore were imported through the Hartlepools, against 82,545 tons in the corresponding period last year. Last month, for the first time, the 1961 aggregate of iron-ore imports, 586,236 tons, was below last year's, 648,484 tons. Coal exports in the period, mostly coastwise, were 120,295 (110,725) tons.

THE Purchasing Officers Association is running a course at the College of Aeronautics, Cranfield, on January 8-11, 1962, on Computers in Purchasing and Stores Departments. This is the second course on computers organized by the association. The leader of the course will be Mr. J. W. Wright, Lecturer in Industrial Administration, Manchester College of Science and Technology.

AMOUNTING TO OVER 60 per cent. of its total production, exports of the Colchester Lathe Company, Limited, a member of the George Cohen 600 Group, Limited, have reached a record figure. Annual output is in excess of 3,500 machines, and extensions to the firm's Colchester factory, when complete, will substantially increase this amount. The additional output will be allocated mainly to export.

FOLLOWING THE RECENT ACQUISITION of certain of the interests of the Pulsometer Engineering Company, Limited, Reading, by G. & J. Weir Holdings, Limited, the products of Joseph Evans & Sons (Wolverhampton), Limited, are now being marketed by G. & J. Weir, Limited, principal manufacturing subsidiary of the Weir group. The Evans range of reciprocating pumps caters for a wide variety of industries.

SOLE OWNER of Krupp's of Essen, Herr Alfried Krupp has applied to the Western Allied Mixed Commission for a fourth one-year extension—to January 31, 1963—of the term during which he is to sell his coal and steel holdings, it is reported. Herr Krupp, who promised the Allies in 1953 to sell his coal and steel holdings after his previously confiscated concern was returned to him, has so far found no buyer.

THIRTEEN-WEEK, 1,600-mile tour of Britain by an exhibition train will be a feature of the solid fuel central heating campaign, to be mounted jointly next spring by the Coal Utilisation Council and the National Coal Board. The "Cosy Train," which will give demonstrations of central heating by solid fuel, will also be used to focus public attention on a programme of exhibitions and showhouses opening in early April.

£10,000,000 TO BE RAISED FOR METHANE TANKERS

LONDON banks and insurance companies are to finance the building of the two tankers which are to import liquid methane gas from the Sahara to the UK. About £10,000,000 is to be raised for the purchase of the ships and their specialized equipment.

Part of the programme of the Gas Council to import liquid methane to reduce the gas industry's production costs, the new ships will be built by Harland & Wolff, Limited, at Belfast, and by Vickers-Armstrongs, Limited, at Barrow-in-Furness (Lancs).

Appointments

Mr. F. E. L. COPLEY and Mr. A. C. HOBDELL have joined the staff of the Drop Forging Research Association.

Mr. RONALD FITCH has been appointed chief accountant at the Trafford Park works of Lancashire Dynamo & Crypto, Limited, a company in the Metal Industries, Limited, group.

Mr. J. A. GOLDSMITH is to join the Steel, Peech & Tozer branch of the United Steel Companies, Limited, on January 1, 1962, as deputy secretary and office manager.

Mr. R. C. JENKIN has been appointed manager of a new office opened by Associated Electrical Industries, Limited, for the Midland region of the home district office at Alma Street, Coventry.

Mr. REGINALD CUTLER, chief accountant of Brookhurst Igranic, Limited, a member of the Metal Industries, Limited, group, has been given the additional appointment of company secretary following the resignation of Mr. Norman Clark.

Mr. W. G. SALISBURY has been appointed personal assistant to Mr. Edgar Denton, managing director of C. R. Denton Steel & Tool Company, Limited, Sheffield. Mr. Salisbury, who will be responsible for quality control of special steels, was formerly head of the steel user section of the British Iron and Steel Research Association at its Hoyle Street laboratories.

Ore mining branch of the United Steel Companies, Limited, has appointed Mr. F. IBBOTSON, formerly manager of Dragonby mine, as assistant group manager, underground mines. Mr. T. P. S. BAXTER, manager of Santon mine, succeeds Mr. Ibbotson, and Mr. J. DARRAGH, undermanager at Santon, becomes manager. Mr. A. S. MARTIN, previously a deputy at Dragonby, is appointed undermanager at Santon.

Colliery Appointments in West Midlands NCB

ACTING manager since September of Victoria Colliery, in the No. 1 (North Staffordshire) Area of the West Midlands Divisional Coal Board, Mr. D. Dorn has been appointed manager. He entered the mining industry in the East Midlands Division, and subsequently held posts as undermanager at several collieries in that division before his appointment in 1957 as assistant manager of Florence Colliery, in the North Staffordshire Area.

Formerly overman, and for a period safety officer, at Desford Colliery, in the No. 7 (South Derbyshire and Leicestershire) Area of the East Midlands NCB, Mr. P. McKniff has been appointed undermanager at Kingsbury Colliery, No. 4 (Warwickshire) Area of the West Midlands Division.

Australia Bids to Increase Coal Exports

IMPROVEMENTS to ports and docks to expand exports of Australian coal are planned. New South Wales is to spend £A6,000,000, and to make the port of Gladstone, Queensland, a major coal-handling port, £A3,000,000 will be involved.

It is estimated that the expenditure in the two states will increase coal-handling capacity of eastern ports to 50,000,000 tons a year and enable Australia to meet the demands of this rapidly expanding industry, now selling more than 2,000,000 tons a year, mostly to Japan.

Coal Chartering

ALTHOUGH a rather better volume of coal tonnage is reported fixed from Hampton Roads, certain fixtures concluded show some weakening in freight values, following the acceptance of a 12,000-tonner from Hampton Roads to ARA for November at 30s. and 15,000 tons for December at 29s. 9d. to the same destination.

As far as Japan is concerned, a 20,000-tonner is reported at $8.75 for December 26/January 5 and there are also reports of large tonnage having been fixed for very forward loading at $9.00 and $8.90, all fixtures basis six days Shinc. Further tonnage has been taken for Brazil, 11,000 tons being fixed to Rio for December 11/21 at $6.75 and 9,500 tons for late December/January at $7.00, same destination, but there does not appear to be any pressure from charterers to cover forward positions to this area.

Some activity continues from Australia to Japan with 40s. 6d. paid from Sydney to Kamaishi for January 2/20 and other tonnage is reported fixed for positions up to February where rates have varied between 40s. 6d. and 43s. 6d., all f.i.o. and trimmed basis. Hampton Roads/Sagunto fixed 14,000 tons at $5.30 for prompt December 10 loading. Gdynia-Gdansk/Buenos Aires reports 42s. for 10,000 tons prompt loading, f.o.b. steamer discharging and Rotterdam or Emden/Porta Marghera, 24s. 3d., for about 15,000 tons, December 20/January 10.

Spoilheap to be Cleared to Allow Open-cast Working

TOWERING mound of pit dirt in Cannock Chase will disappear in a combined operation by open-cast and deep mine engineers. Some 3,000,000 tons of dirt tipped at Mid-Cannock Colliery since 1914 is to be moved in less than a year, to allow the Opencast Executive of the NCB to mine 300,000 tons of coal lying in a 10-acre pocket of 24 acres to be cleared. The operation will also take care of Mid-Cannock Colliery's dirt-tipping problem for years to come. A 10-acre hold, over 200 ft. deep in parts, will be left near the coal preparation plant to receive spoil.

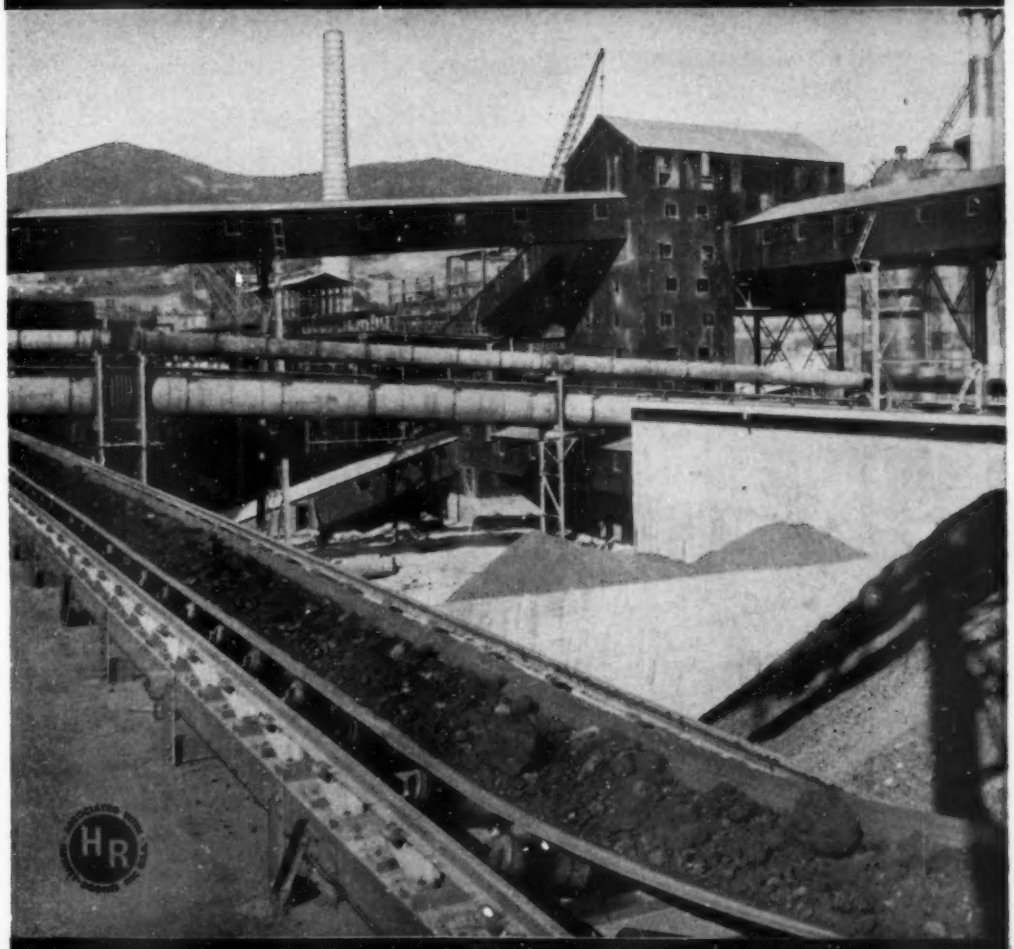
The site includes a decapitated cone tip standing 180 ft. above natural ground level and a plateau-shaped tip, about 100 ft. high, which will also be cleared. Extensive open-cast workings have been going on in the neighbourhood for several years, and have now reached the foot of the cone tip. The operation will start early in the New Year. The seams to be reached total 25 ft. in thickness, and are up to 250 ft. deep.

UNDERGROUND GAS STORAGE

PLANS to store gas underground in an area of about 3,500 acres in and around Chilcomb, near Winchester (Hants), are being prepared by the Gas Council, which is promoting a private bill in Parliament to authorize this, with the consent of the Ministry of Power. If the scheme is approved, the industry will store gas during the summer, when demand is low, for use during the peak demand periods in the winter.

Chairman of the Gas Council, Sir Henry Jones, has invited land owners and other interested parties to a meeting in the Guildhall, Winchester, when the scheme will be further explained.

Mine to mill, ship to shore, start to finish



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Imports and Exports of Iron and Steel

FIGURES of imports and exports of iron and steel in October are given in the following tables, based on the Board of Trade returns, and including totals for the first 10 months of 1960 and 1961.

Total Exports of Iron and Steel

Destination	Month ended Oct. 31	Ten months ended October 31.	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Malta	653	4,902	4,725
Sierra Leone	563	6,098	8,059
Ghana	3,589	19,014	16,551
Nigeria	3,758	50,468	57,008
Union of South Africa	7,743	54,952	51,922
South-West Africa	794	5,039	12,826
Rhodesia and Nyasaland	2,157	22,818	25,587
Tanganyika	3,201	12,756	25,964
Kenya	1,603	24,589	31,979
Uganda	172	1,269	2,053
Mauritius	75	4,070	1,535
Bahrein, Qatar, and Trucial States	1,141	12,403	15,435
Kuwait	61	5,368	17,291
India	10,147	212,913	160,403
Pakistan	3,090	55,254	68,601
Singapore	1,808	17,611	20,910
Malaya	2,425	15,408	22,584
Ceylon	2,074	43,565	31,405
British North Borneo	72	3,852	2,242
Hongkong	9,773	69,231	76,179
Australia	4,757	149,665	102,139
New Zealand	7,353	102,232	180,839
Canada	9,780	177,191	102,913
Jamaica	1,348	20,054	13,785
Trinidad	4,585	32,847	38,176
British Guiana	266	7,518	7,169
Other Commonwealth countries	1,705	21,926	25,015
Eire	6,516	51,849	63,560
Soviet Union	13,203	24,303	41,999
Finland	4,541	40,426	53,314
Sweden	18,096	145,547	141,147
Norway	7,777	97,673	107,822
Denmark	8,240	82,607	86,358
Poland	11,768	9,719	42,497
Western Germany	13,560	116,618	97,649
Eastern Germany	1,421	18,383	19,747
Netherlands	6,954	100,032	95,810
Belgium	1,833	28,231	26,279
France	1,508	7,099	11,217
Switzerland	1,938	12,049	19,270
Portugal	2,611	13,605	24,569
Spain	2,696	40,299	21,538
Italy	9,165	36,260	67,287
Austria	317	4,304	4,613
Yugoslavia	1,214	32,339	23,703
Greece	2,429	17,052	30,581
Turkey	305	17,621	12,030
Netherlands Antilles	110	2,814	1,463
Portuguese East Africa	150	3,806	2,051
Egypt	1,439	11,878	26,230
Libya	4,194	33,669	23,488
Sudan	1,128	8,086	8,803
Israel	1,764	16,326	19,570
Saudi Arabia	20	375	1,051
Iraq	1,681	37,832	28,076
Iran	2,339	*60,102	29,649
Burma	243	4,961	5,506
Thailand	426	5,434	4,871
Indonesia	364	20,502	3,322
China	489	45,719	11,031
Japan	22,621	58,363	156,459
Philippine Republic	1,302	6,427	5,237
USA	19,334	172,373	117,447
Cuba	13	6,624	849
Mexico	768	5,085	3,822
Colombia	5,689	7,874	15,062
Venezuela	3,084	30,083	23,425
Ecuador	88	2,479	2,206
Peru	1,017	5,321	7,486
Chile	281	3,603	2,813
Brazil	798	23,339	14,185
Uruguay	894	7,585	7,909
Argentina	18,258	72,121	147,497
Other foreign countries	5,625	51,089	57,522
TOTAL	294,904	2,752,899	2,841,315

Total Imports of Iron and Steel

From	Month ended Oct. 31	Ten months ended October 31	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Union of South Africa	2,058	25,641	29,986
Rhodesia and Nyasaland	232	6,606	19,399
Canada	3,477	219,708	75,074
Other Commonwealth countries and Eire	1,659	43,411	36,335
Soviet Union	12,514	27,596	35,138
Sweden	4,450	41,119	40,763
Norway	14,041	129,914	98,840
Poland	49	8,645	880
Western Germany	2,681	113,863	22,478
Netherlands	14,536	168,272	101,652
Belgium	2,702	97,900	29,525
Luxembourg	143	13,150	10,273
France	1,044	58,090	16,085
Italy	4	21,606	503
Austria	45	10,333	4,307
Japan	427	5,939	5,406
USA	685	325,647	11,053
Other foreign countries	288	133,271	10,256
TOTAL	61,126	1,450,711	548,553
Iron and steel scrap and waste fit only for the recovery of metal	2,118	221,171	19,896

Exports of Iron and Steel by Product

Product.	Month ended Oct. 31	Ten months ended October 31	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Pig-iron	19,513	128,450	106,459
Ferro-columbium (niobium)	6	89	76
Ferro-tungsten	144	797	1,119
Other ferro-alloys	363	9,348	3,340
Ingots, blooms, billets, slabs, sheet bars (incl. tinplate bars), and similar primary forms	7,763	22,024	90,956
Pieces roughly shaped by forging	52	803	1,579
Iron bars, rods, angles, shapes, and sections	194	1,365	1,830
Steel bars, rods, angles, sections, and shapes	52,907	508,443	560,011
Iron plates and sheets	—	528	795
Universal plates	2,540	16,993	15,674
Steel plate, 3 mm. and under 4.5 mm. thickness	1,857	32,569	33,315
Ditto, 4.5 mm. or more in thickness	40,675	287,303	299,002
Blacksheets and blackplate	38,945	247,708	336,937
Hoop and strip	8,627	84,600	93,152
Tinplate	36,095	414,431	350,947
Decorated tinplate	362	5,140	5,238
Galvanized sheets	6,278	68,967	58,002
Other (incl. tinned sheets, terneplate, and ternesheets)	4,047	23,354	34,974
Railway and tramway construction material	5,343	144,120	158,951
Wire rods of steel (incl. alloy steel)	4,875	45,665	51,241
Wire	10,263	98,720	109,004
Tubes, pipes, and fittings	54,055	611,482	528,713
TOTAL	294,904	2,752,899	2,841,315

MARCH PRODUCTION figures for the Broken Hill Proprietary Company, Limited, and Australian Iron & Steel Proprietary Company, Limited, showing total for both companies in tons are:—Coke, 214,200; pig-iron, 248,127; steel ingots, 331,990; bloom and slab mills, 271,698; heavy and continuous mills, 156,738; plate and strip mills, 88,205; merchant mills, 74,002; rod mill, 12,498; cold rolling mills, 1,826; tinplate, 8,011; steel foundry (excluding ingots), 1,070; iron foundries, 8,689; spun pipes, 4,809. Amounts of raw materials shipped during the month were:—Ironstone, 423,668 tons; limestone, 21,728 tons; and dolomite, 13,100 tons.

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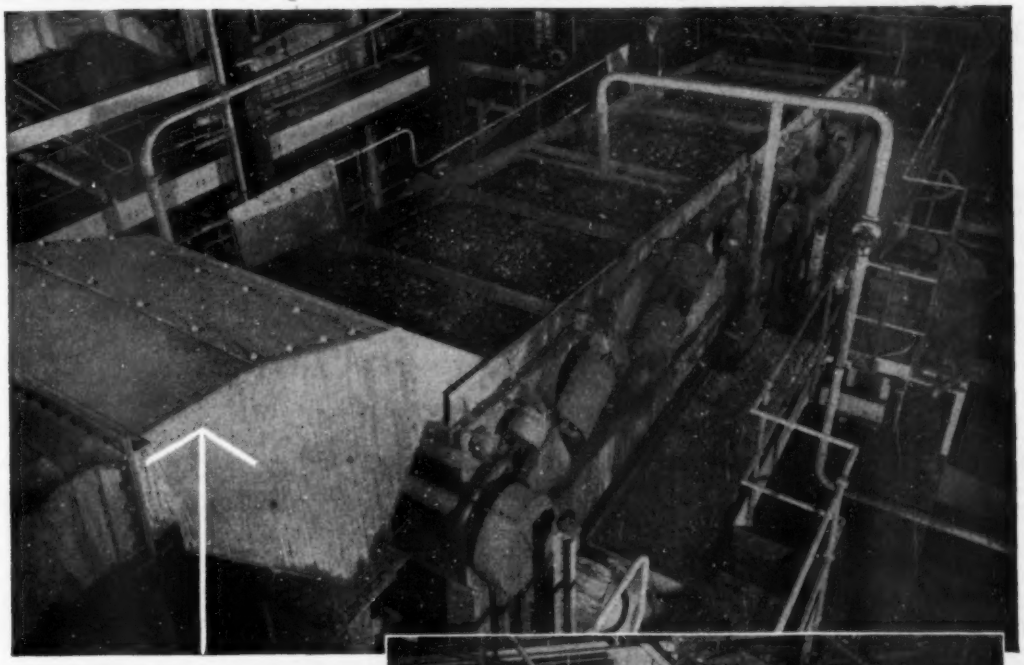

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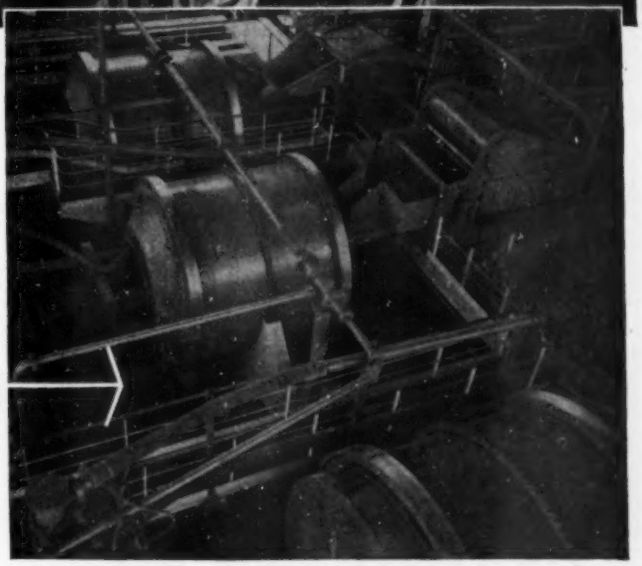

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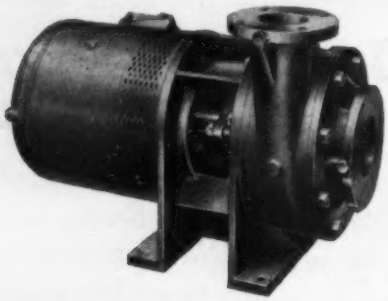

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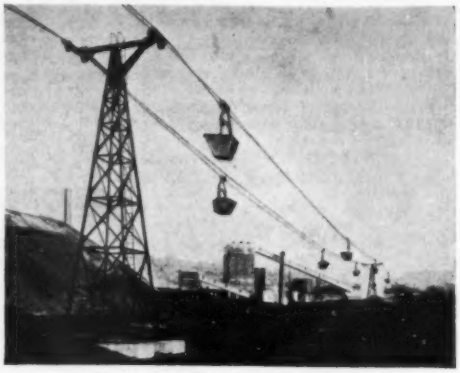

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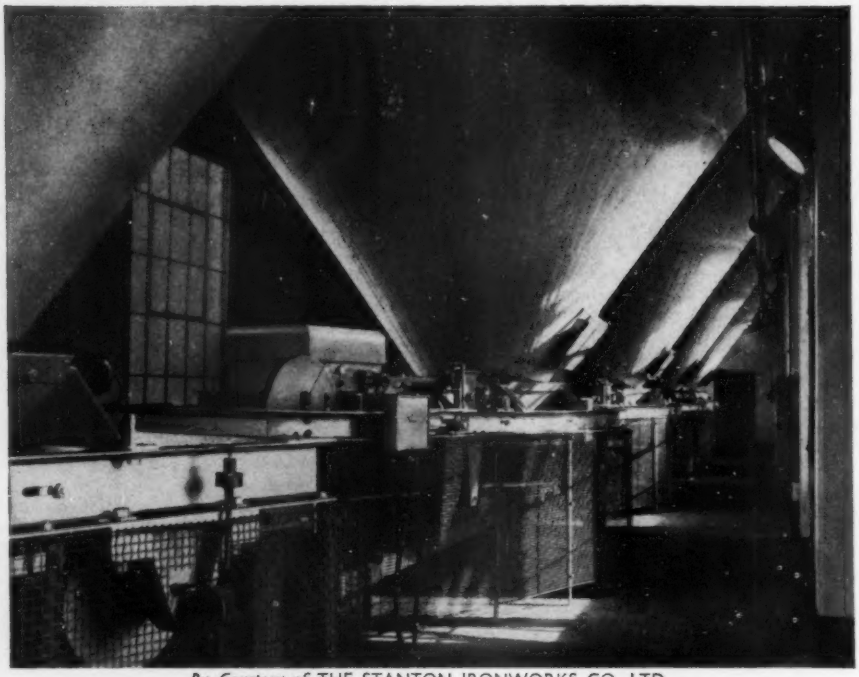

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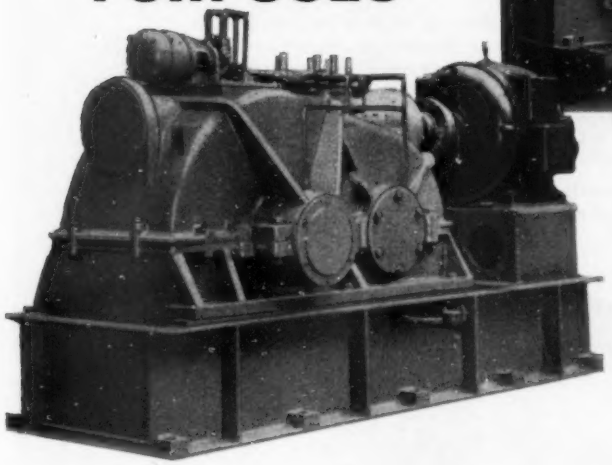

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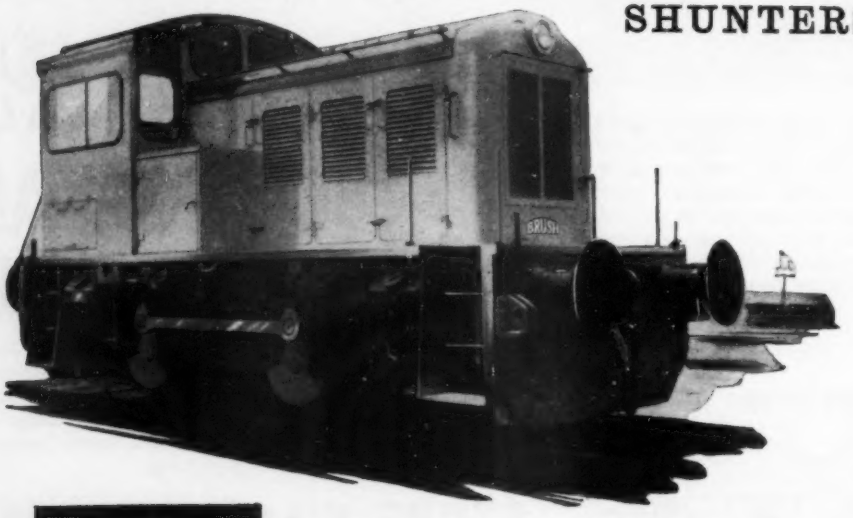

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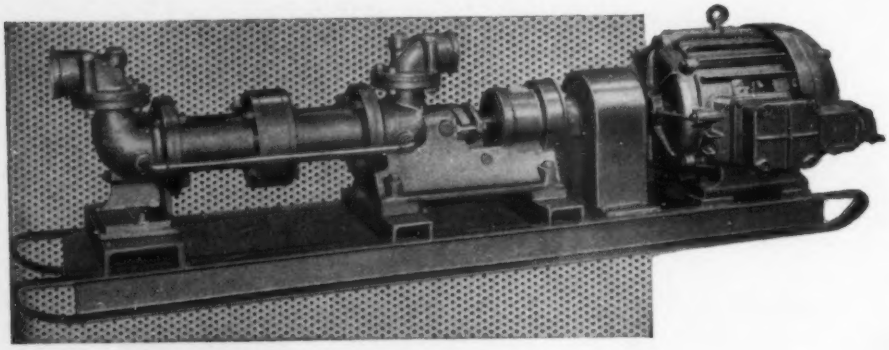

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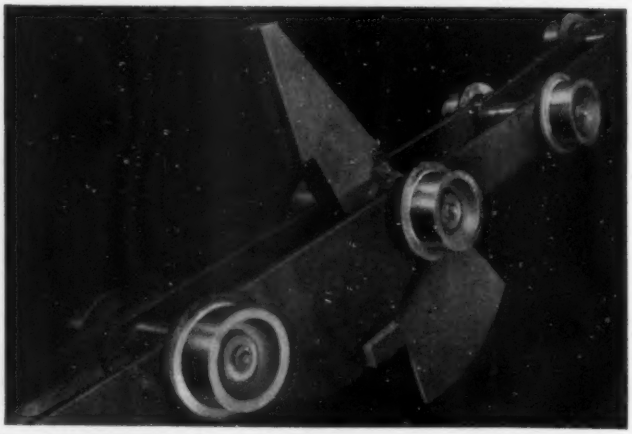

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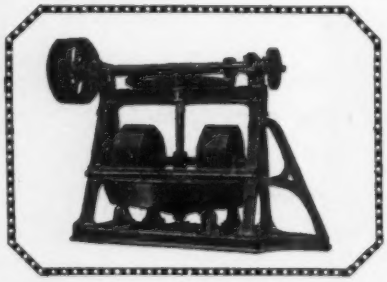

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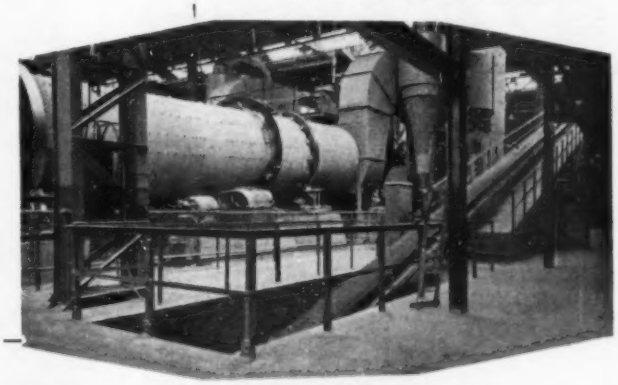

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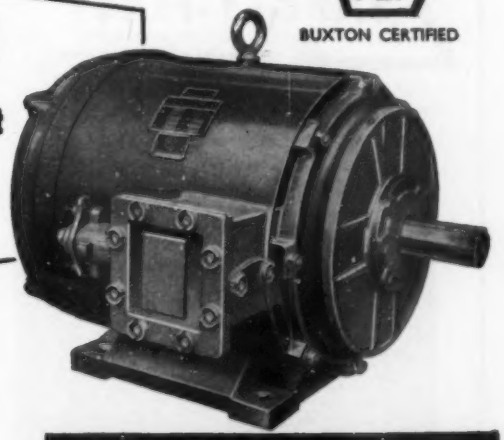

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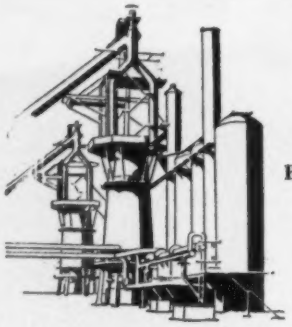

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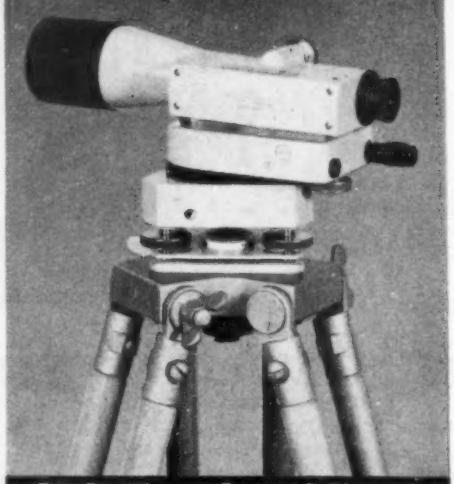

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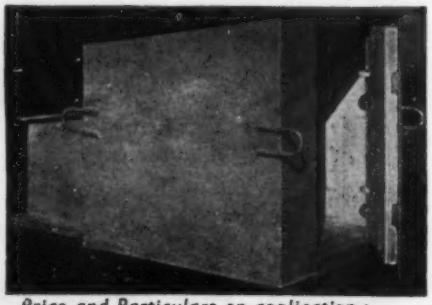

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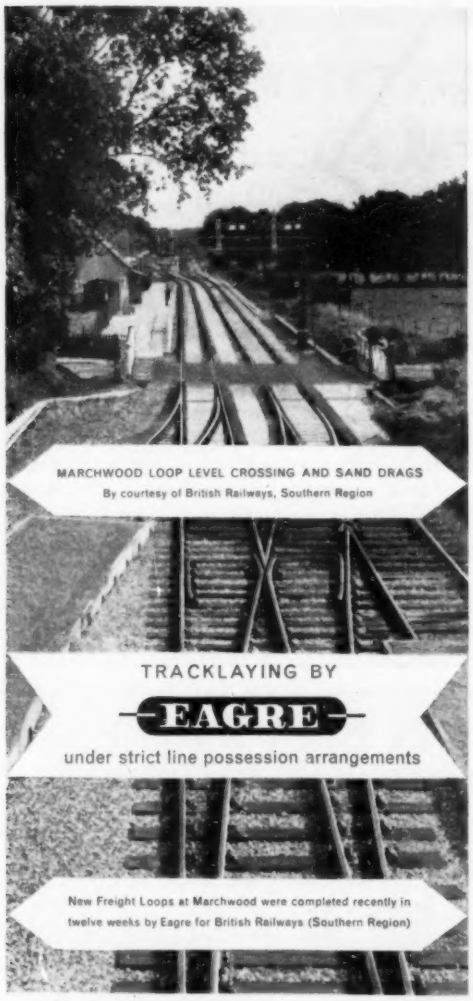
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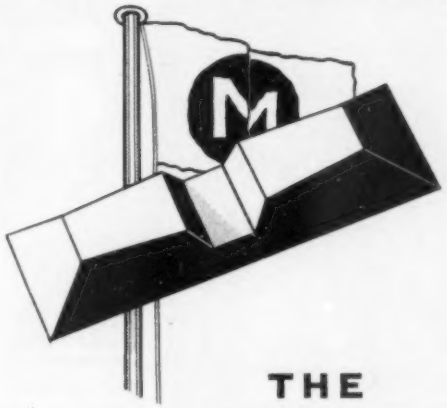

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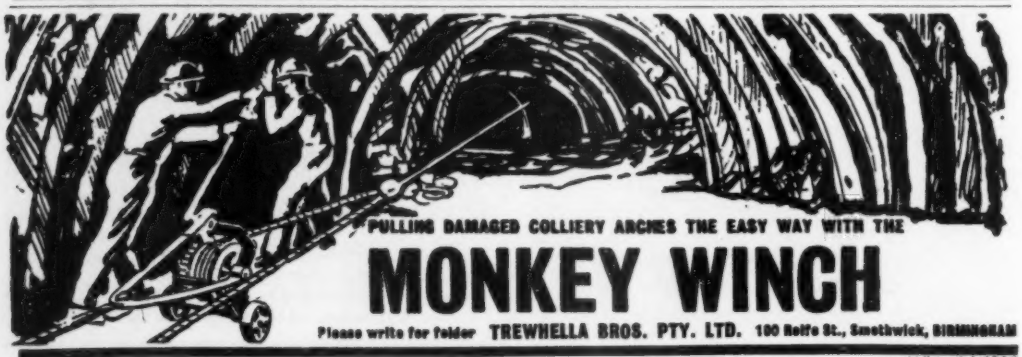

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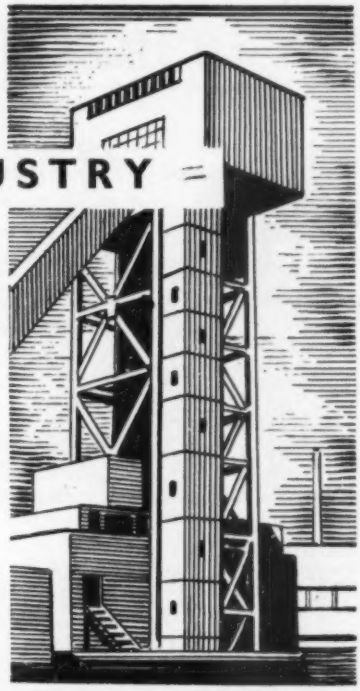

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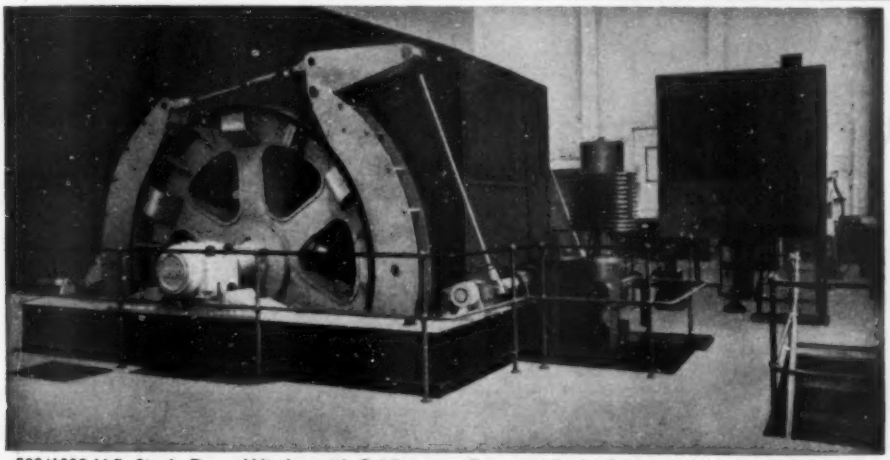

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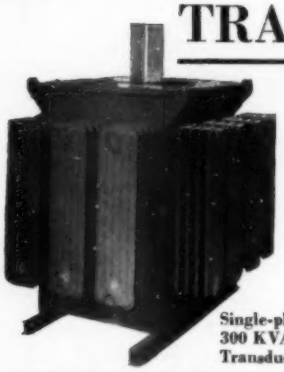

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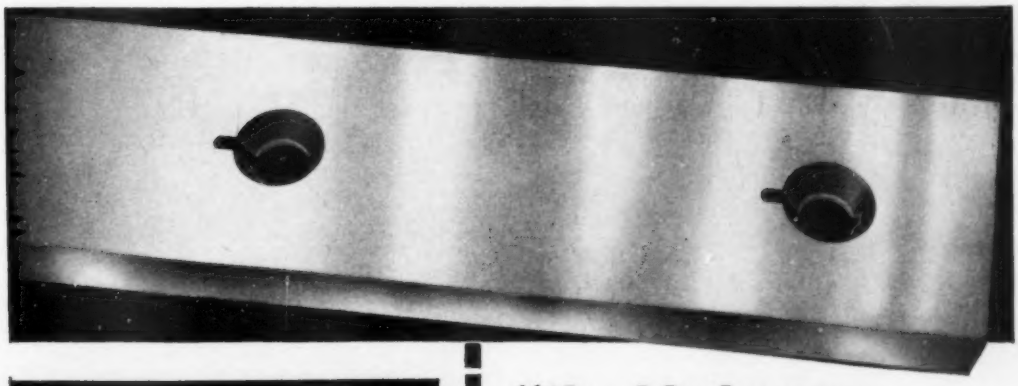

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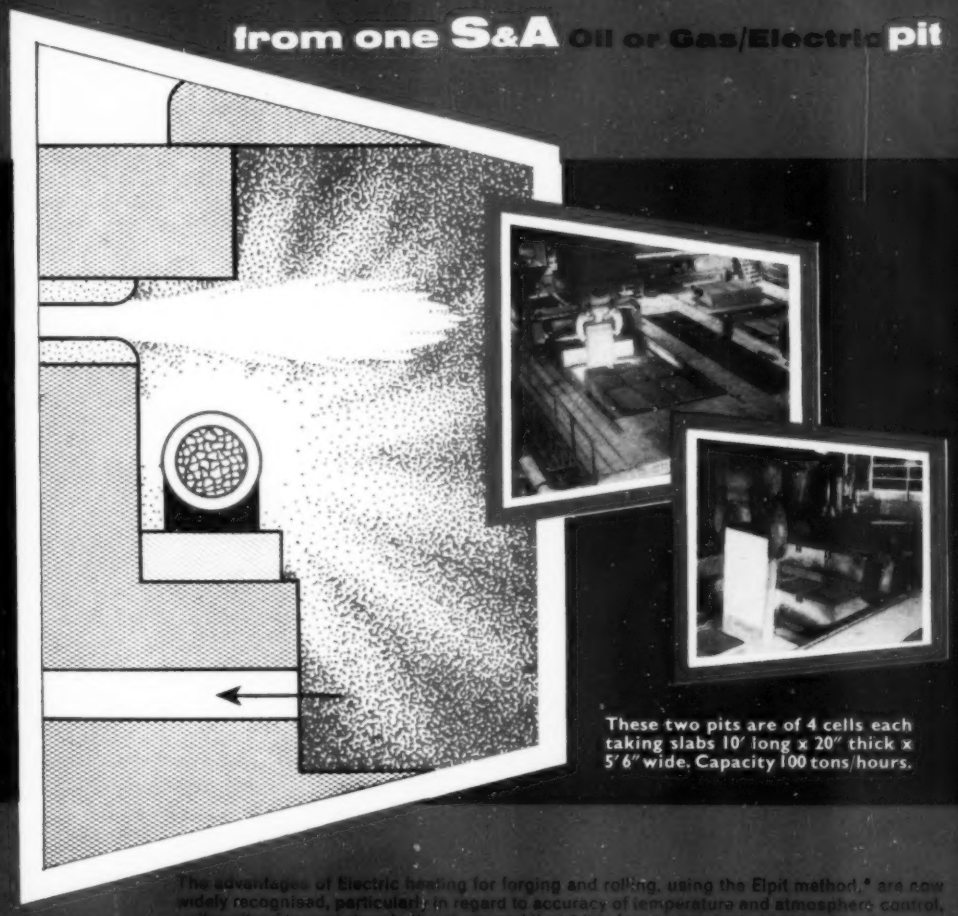

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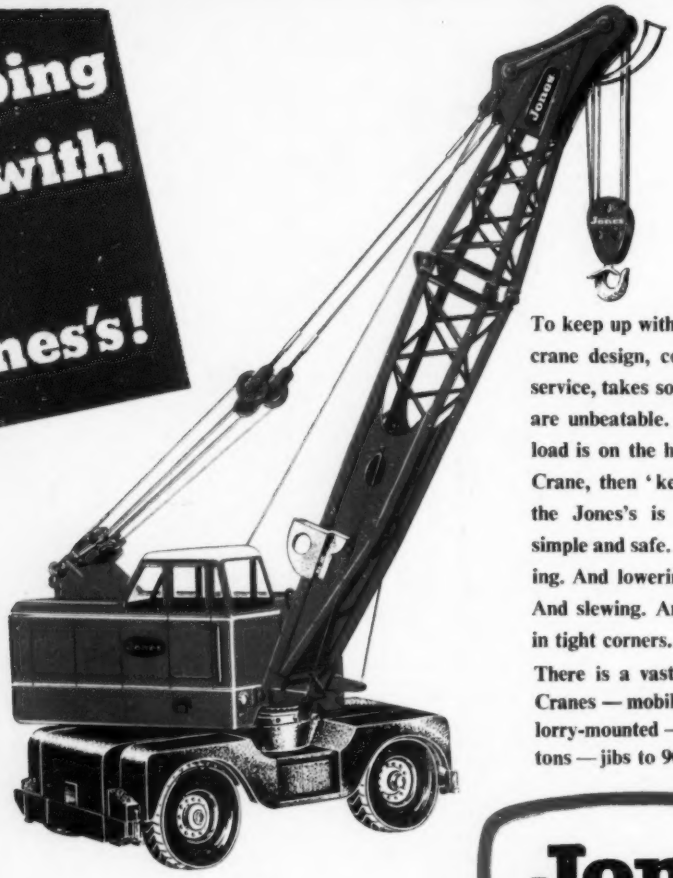

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